MAR 30 1943

ENGINEERING NEWS-RECORD

MARCH 25, 1943

ENGINEERS IN THE MARINE CORPS

By Lt Col George E. Tomlinson

Drainage facilities for Henderson Field on Guadalcanal, which were installed by Marine combat engineers who landed with the first troops (See page 64).

For high resistance to corrosion

this subway-type transformer case is

BYERS WROUGHT IRON

With electricity supplying 60% or more of the power for the nation's war production needs, every piece of generation or distribution equipment has front-line responsibilities. Failure from any cause threatens war effort, and repairs divert critical materials badly needed elsewhere.

To extend life and reduce maintenance on subway-type transformers, which face severe corrosive conditions, engineers of the Philadelphia Electric Co. investigated the possibility of using wrought iron. The illustration shows one of the units purchased in connection with this investigation; the wrought iron case was fabricated by Allis Chalmers Manufacturing Co.

Philadelphia Electric has also used wrought iron for replacement of housings on subway switches which are exposed to similar severe corrosive conditions.

The performance of wrought iron in previous transformer case installations of another company (6 years in a damp vault with no maintenance or painting necessary) and in other applications where corrosive conditions were similar, very definitely recommends the use of the material.

Do you have any applications where corrosion or fatigue cause premature failure of ordinary materials? If so, wrought iron can probably help you . . . and it is easy to find out. Just write our Engineering Service Department, and case histories covering similar applications will be sent you.

If you have any questions as to availability and deliveries, please don't be influenced by rumor or hearsay as to what you can or can't get. When you, as the specifier, decide that wrought iron is the best and most durable material to use, and the Government by its rating indicates approval, just contact a Byers Field Service Engineer, the nearest Division Office, or Pittsburgh. You will then know exactly what to expect.

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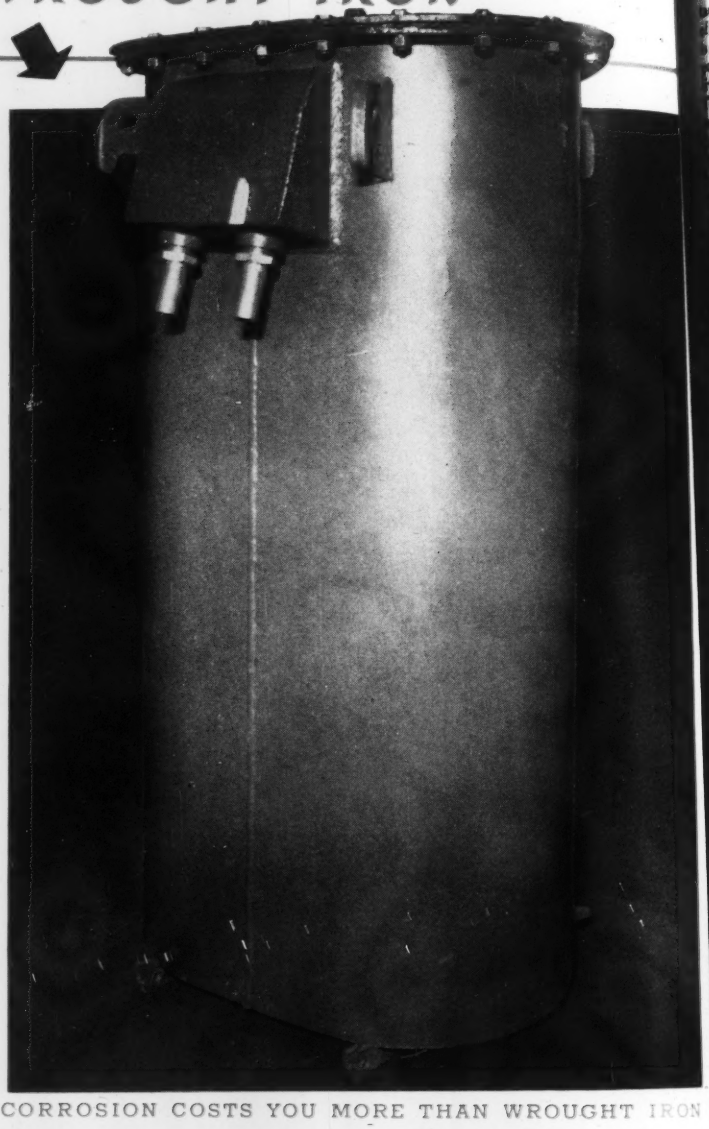

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TUBULAR AND HOT ROLLED PRODUCTS
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...ol. 130 MARCH 25, 1943 No. 12

...COMING NEXT

• The importance this country at...aches to the economic development ...f our good neighbors to the South ...s evidenced by an illuminating re...ort—Highway Exploration in Bo...ivia—to appear in *ENR*, April 8. ...his survey was conducted by engi...eers of the U. S. Public Roads Ad...inistration in cooperation with en...ineers of the Bolivian highway de...artment, all as part of a study being ...ade by the U. S. Economic Mission.

• How the use of an imported sea...oing ladder dredge aided the U. S. ...ngineering Department in overcom...g a difficult harbor dredging prob...m will be described in the April 8 ...ue. This equipment, not common ...American practice, cut rock that ...therwise would have had to be ...dobie blasted, thus saving much ...ime and large quantities of critical ...xplosives.

• Latest ideas in shipyard design, ...here maximum use of prefabrica...ion methods is desired, calls for ...lock high outfitting docks. Design, ...construction and operating efficiency ...f a six-way yard of this type built ...nder a high-speed construction pro...gram will be discussed in *ENR* for ...April 8.

LOOKING AHEAD

• Ten years ago San Francisco discarded an antiquated garbage incinerator and began its first scientific landfill project. To date, the fill has covered a 90-acre area, having consumed some 1,800,000 tons of waste. From this ten year experiment has been gained much practical knowledge that is worthy of note. Rate of fill settlement, equipment found most economical of operation, characteristics of the exposed face, and technique of cover placement are discussed in an article to be published in an early issue.

• The necessity for conserving steel has been turned into a virtue by the Navy in the design of its latest blimp hangars. By use of timber, spandrel-braced arches of 246 ft., span and rising to a height of more than 170 ft., a record for this type of construction has been established. Design features were covered in *ENR* for Oct. 22, 1942. In a forthcoming article erection methods will be detailed.

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CHANGE OF ADDRESS

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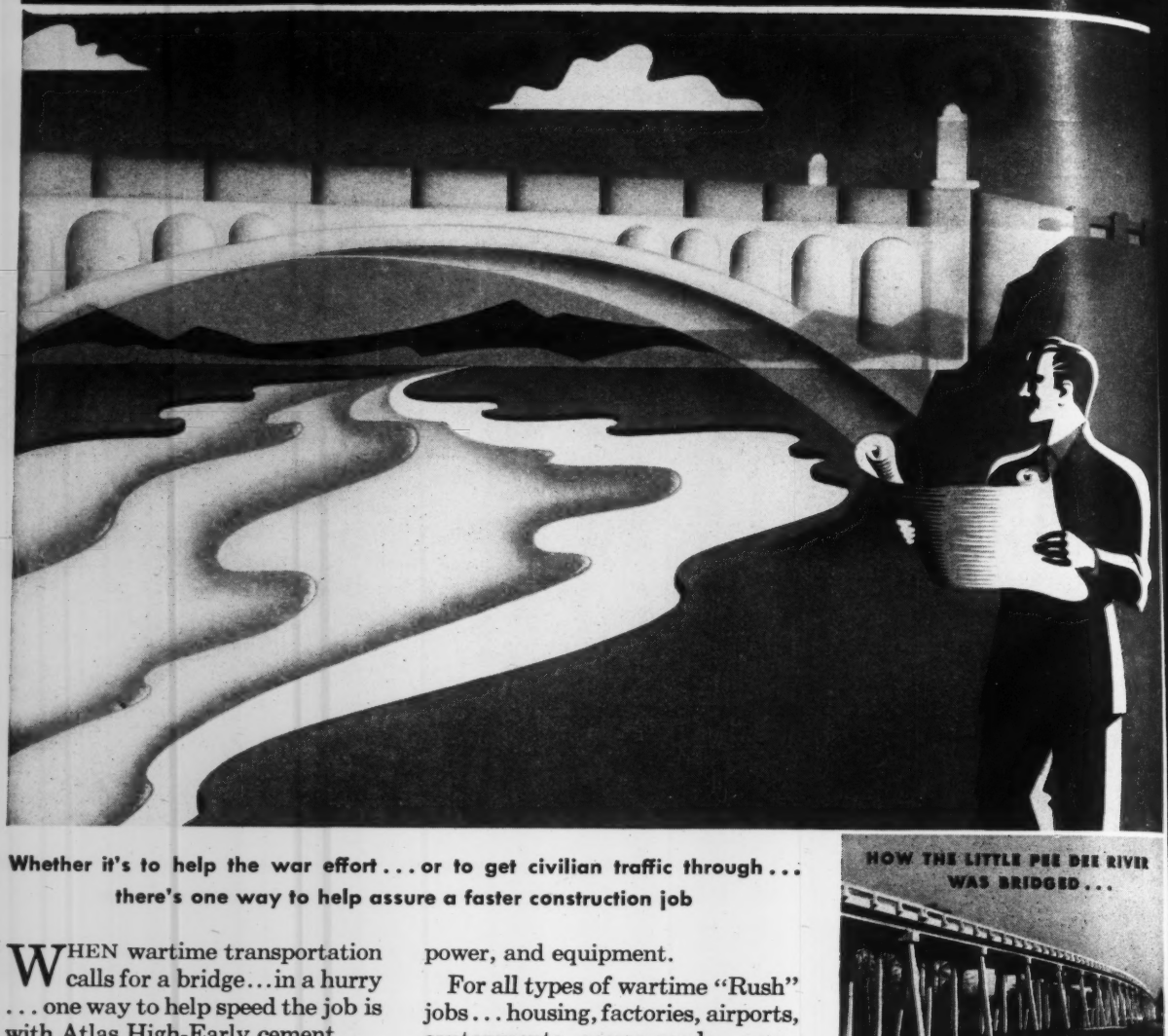
How to turn a blueprint into a bridge . . . QUICKLY



Whether it's to help the war effort . . . or to get civilian traffic through . . . there's one way to help assure a faster construction job

WHEN wartime transportation calls for a bridge . . . in a hurry . . . one way to help speed the job is with Atlas High-Early cement.

Atlas High-Early gains strength rapidly. It produces serviceable concrete often in one-fifth the usual time. It saves manpower by releasing men for new jobs more quickly. It saves lumber because forms often can be stripped in 24 hours instead of 3 to 5 days. It shortens the time required for protection and curing by as much as 70%. It reduces overhead by saving time, manpower, and equipment.

For all types of wartime "Rush" jobs . . . housing, factories, airports, cantonments, access roads . . . you can depend on Atlas High-Early cement to give you serviceable, durable concrete . . . *FAST*. Universal Atlas Cement Company (United States Steel Corporation Subsidiary), Chrysler Building, New York City.

• • •

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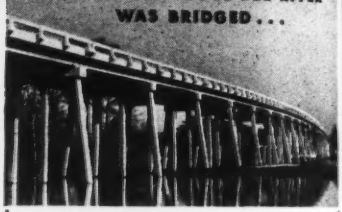
HOW THE LITTLE PEE DEE RIVER WAS BRIDGED . . .



. . . 14 DAYS QUICKER

For construction of the Potato Bed Ferry Bridge over the Little Pee Dee River, Atlas High-Early cement was specified for piling. Why? South Carolina Highway Specifications state, "No pile shall be driven until it is at least 24 days old and in cold weather for a longer period as determined by the engineer. This period may be reduced to 10 days if high-early strength is used"—a saving of 14 days!

Atlas High-Early cement provided other advantages, too. Forms were stripped and reused . . . saving time, materials, and manpower.

ENR-H-53

SAVE TIME IN WARTIME WITH

Atlas High-Early Cement

A UNIVERSAL ATLAS PRODUCT

The Week In Engineering and Construction

GINEERING NEWS-RECORD • MARCH 25, 1943 • VOLUME 130 • NUMBER 12

Tentative procedure for controlled materials plan

War Production Board explains method to be followed for construction projects. Pending issuance of final regulations "claimant agencies" will handle authorizations.

To clarify the situation with respect deliveries of controlled materials for struction projects and plant facili- pending the issuance of a formal ulation under the Controlled Ma- ials Plan, the War Production Board explained the procedures to be fol- ed. In general, authorization to ob- controlled materials for construc- and facilities will be handled by various claimant agencies to whose isdiction the projects have been as- ned.

The Controlled Materials Plan under ich raw materials are to be distributed the future was first announced last l. Detailed regulations were issued rly this year. The plan is to go into ect, in large measure, April 1. How- er, since regulations had not yet been ued covering the application of the an to construction, WPB issued the emorandum establishing a tentative ocedure by which construction projects n get materials under the plan pend- g the issuance of a formal regulation.

The CMP is an allotment scheme as the three "controlled materials"— eel, copper, and aluminum. It is a iority rating scheme as to other ma- rials. Basis of the system is that, once very quarter, WPB's Requirements Com- ittee will divide up the available sup- y of the controlled materials among ourteen "claimant agencies." These are overnment agencies, which either place ontracts with industry or are in charge certain types of industrial activity. hey are: Army, Navy, Maritime Com- ission, Aircraft Resources Control Office, Lend-Lease, Board of Economic Warfare, Office of Civilian Supply, De- artment of Agriculture, Office of De- ense Transportation, Office of Rubber Director, WPB Facilities Bureau, Petro- eum Administration, National Housing Agency, and the Office of War Utilities Director.

After a quota of controlled materials has been assigned to these agencies, they in turn parcel it out to individual users of raw material under their jurisdiction. They do this by granting the user an "allotment number" that entitles him to a definite quantity of the materials. All allotment numbers have equal value. After July 1, no deliveries of controlled materials may be made except on allotment numbers. During the second quarter, deliveries may also be made on priority ratings, but only after allotment numbers have been served.

Original intention was to put all construction projects under the jurisdiction of the Facilities Bureau and let them obtain materials by allotment from it.

Under the tentative procedure now set up, however, construction projects have been assigned to the different claimant agencies. All projects authorized by WPB prior to Feb. 17, 1943, are supposed by now to have been assigned to particular agencies, and the agencies are supposed to have instructed project owners to submit an application for allotment number. Projects authorized in future will be assigned to agencies at that time.

Before April 1, all construction projects should have been assigned allotment numbers covering their second quarter requirements for steel, copper, and aluminum. They will also receive priority ratings covering their requirements of other materials. These should be used in the usual way, except that a priority rating accompanied by an allotment number takes precedence over the same priority rating not so accompanied.

• • •

Work halted on three new rubber plants

Halting of construction work on three large plants for manufacture of butadiene from petroleum to be used in the synthetic rubber production program has been recommended by William M. Jeffers, director, Office of Rubber Conservation.

Two of the plants on which construction work was halted when the WPB revoked preference ratings for materials needed are in Texas, the plant of the Magnolia Petroleum Co. of Dallas under construction at Beaumont, and the plant of the Pan-American Refining Corp. of Texas City. The third plant was a $15,000,000 project sponsored by the Standard Oil Co. of Indiana.

The Office of the Director of Rubber Conservation explained that halting of construction work at these plants was recommended when it became apparent that some of the large butadiene units may ultimately be operated at more than their first rated capacity.

Price control revoked on construction

Price control over the construction industry has been eliminated by Price Administrator Prentiss Brown. Regulation 251, governing construction, will soon be cancelled. Meanwhile, the regulation has been made ineffective, for all practical purposes, by an amendment eliminating the reporting features. The entire control procedure of the regulation is based on reports by contractors of the factors in the computation of their price. With these reports no longer required, the regulation becomes meaningless.

The only type of construction over which it is intended to keep control is house repair and sale of building materials on an installed basis. Price control over these transactions will be incorporated in other price regulations, and when this has been done, Reg. 251 will be formally revoked.

Prentiss Brown personally revoked Reg. 251. It was done suddenly, without much consultation of the men who have been working on the regulation, in response to congressional suggestion. Last week, when Mr. Brown consulted with a group of congressmen as to measures which might increase OPA's popularity, Reg. 251 was brought forward as an example of a regulation that was more irritating than effective.

New naval public work to total $1,250,000,000

A billion and a quarter dollars worth of new naval public works was authorized by the Senate last week in a bill which had already passed the Senate. Biggest item covers expenditure of $720,000,000 on "advance bases"—naval bases outside the continental United States. No details on this work are available, and it is asumed that much of the construction will be done by the Navy with its own forces.

The present authorization brings the total of authorized naval public works since the beginning of the expansion program in 1939 to five and a half billions. Of the new authorization, it is estimated that about a quarter billion will be obligated before July and the remainder in the following year.

In addition to advance bases, the present measure authorizes $67,900,000 for expansion of various fleet facilities in the U. S. and $223,000,000 for aviation facilities. The latter includes $54,750,000 for eleven new stations, and the rest is for improvements at existing stations. A $50,000,000 item for ordnance storage includes provision for a new $25,000,000 ammunition depot.

• • •

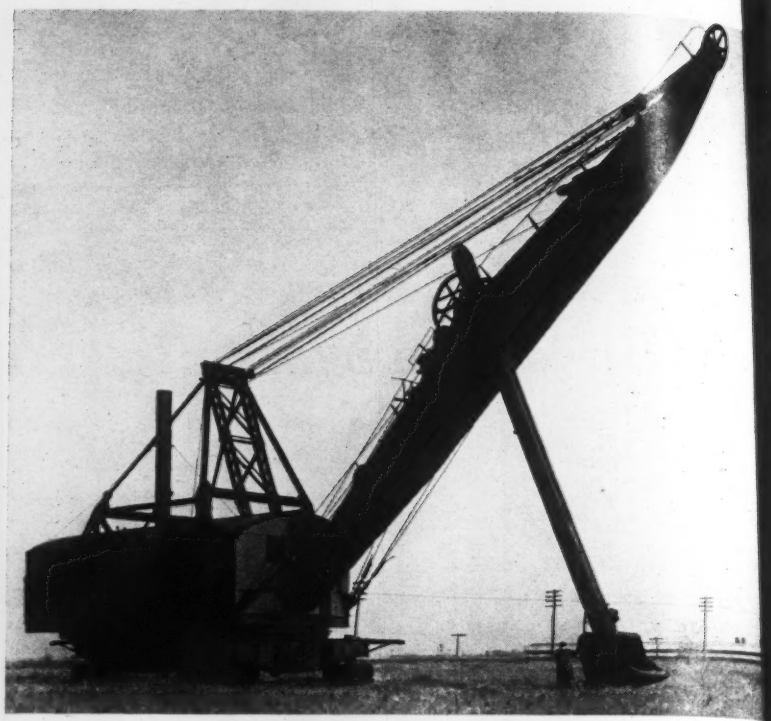
WPB revokes authority to start road work

Wiping out previous procedure, the War Production Board on March 15 revoked the authority to begin highway construction under certain conditions granted in Serial No. L-41-600 issued May 8, 1942. That order permitted work to start that involved no critical materials. Henceforth no road construction jobs may be commenced, under any circumstances, without previous authority having been granted by the War Production Board. This holds true regardless of whether priorities assistance is required or the use of critical materials involved.

Under the new procedure, applications for authority to begin construction on jobs costing more than $100,000 must go to the Facilities Review Committee of the WPB. Similarly, all projects requiring federal funds must go to Washington for certification as to their essentiality. On the other hand, projects costing less than $100,000, where federal funds are not required and where no priority assistance is needed, can be approved by regional offices of the WPB if approved by distict engineers of the Public Roads Administration. The regional offices can approve highway projects costing less than $10,000 even when priority assistance is required.

The present move, which is disturbing to highway officials, will make more bothersome the present uncertainty as to the priority status of highway projects. Some months ago a solution was supposed to have been worked out on the basis that quarterly allocations of material would be made to the Public Roads Administration, which would then be responsible for assigning the material to specific projects. This is similar to the arrangement now in effect for housing. Although the allocations have been made, however, present practice is to require individual approval by WPB's Facilities Review Committee of all jobs costing more than $100,000. The committee has rejected so many projects approved by PRA that hardly more than half the first-quarter allocation of 25,000 tons of steel is actually being used this quarter.

Purpose of the new limitation on projects using no scare materials is primarily conservation of equipment. Although construction work is declining, and although current output of new equipment amounts to about a billion a year, the demand far outstrips the supply, WPB's Construction Machinery Division emphasized in a statement issued this week.



Scrapped for its boiler and its steel

A quarter-century ago, this big coal stripping shovel was a famous and unprecedented machine, one just like it being used to excavate the Calumet Sag Channel of the Chicago Drainage Canal system. Today it is on its way to the junk pile, its steam boiler destined for more years of service in a war plant, its steel for scrap to make war materials. Costing over $100,000 when new, this 6-yd. shovel, weighing over 300 tons, is now rated as a small shovel in the coal strip-mining business, where dippers as large as 36 yd. are in use. The Equipment Corporation of America, dealer in rebuilt construction equipment, which is dismantling the shovel, believes it to be one of the largest single units for the scrap dri

ARBA to discuss present and future road problems

Some of the current problems to be discussed at the meeting of the American Road Builders Association in Chicago May 5-6-7 include: utilization of construction equipment, manufacture and distribution of repair parts, the potential construction program for 1943, highway maintenance, federal assistance for the rehabilitation of war-torn highways, manpower, and changes in federal policy pertaining to construction.

Of equal importance will be that part of the program directed toward winning the peace. At least one meeting will be devoted entirely to postwar highway construction problems.

• • •

Iowa engineering exams

The Iowa State Board of Engineering Examiners will hold its next examination for professional engineers on Mar. 29-30 and land surveying on Mar. 31. Applicants are to report at 9 a.m. at the State House, Des Moines, Iowa.

Poor welding and poor steel caused failure of tanker Schenectady

Report emphasizes that careless welding procedures and a bad joint detail resulted in high residual stresses.

Failure of the all-welded steel hull of the 16,500-ton tanker *Schenectady* was due to a combination of excessive welding stresses, non-uniformity of steel, faulty methods of construction, according to the report of a special committee of investigation appointed by the American Bureau of Shipping. The tanker split in two Jan. 16, 1943, at 11 p.m., while floating at dock in Portland, Ore., after having successfully completed her sea trials (*Engineering News-Record* Nov. 26, 1942 p. 744 and Jan. 7, 1943, p. 191). Although she was the first such tanker built at the new Swan Island yard of the Oregon Shipbuilding Corp., other ships of the same type have been in successful use for nearly a year.

Cause of failure

It is the opinion of the committee that the principal cause of failure was the accumulation of an abnormal amount of internal stress, locked into the structure by the processes used in construction, together with an acute concentration of stress caused by defective welding at the starboard gunwhale, augmented by the hogging stress due to the ballasted condition (the fore and aft tanks being loaded, while the tanks amidship were empty). The accumulation and concentration of stress caused a tensile failure at the starboard sheer strake, which was formed of steel of substandard quality, all of which was aggravated to some degree by a drop in atmospheric temperature.

In reviewing the accident, the committee points out that the *Schenectady* suddenly and without warning, broke in two amidships, fracturing her deck structure at a point just abaft the after end of the bridge, the fracture extending down both sides to the bottom shell plates. All deck, side and bottom longitudinal frames fractured, as did the plating of the corrugated longitudinal bulkheads and the centerline deck and bottom girders, thus constituting a complete structural failure except for the flat section of the bottom shell plating. In no cases did fractures occur in the transverse welds. From the appearance of the fracture, says the committee, the tearing of the side shells was more gradual than the sudden break in the deck from gunwhale to gunwale.

In listing factors contributing to the failure, the committee places particular emphasis on the lack of good welding technique and departures from recognized fundamentals of good welding in an effort to speed up construction. The committee also points out that there was a serious accumulation of shrinkage stresses as a result of the automatic machine welding of the longitudinal joint at the gunwale attaching the sheer strake to the stringer plate. This particular welded joint, where the failure is said to have started, is said to have poorly located and to have evidenced not only a longitudinal crack, but also minute transverse cracks in the weld. A further contributing factor was revealed by tests of the particular sheer strake where the fracture apparently started, which showed a steel of substandard quality as compared with other plates investigated, particularly as to strength and brittleness; cited qualities are a 10,000 lb. per sq. in. proportional limit, low Charpy impact values, and brittleness in the notch-bend test.

Poor subassemblies

The committee also calls attention to the fact that sister vessels of the *Schenectady*, under construction at the time of the investigation, showed some poorly-fitted large sub-assemblies, requiring considerable jacking for proper fit. In other cases, open joints needed an excessive amount of welding to finish the joint, a condition which could result in heavy shrinkage stresses.

In commenting upon some of the previous statements that have been made as to possible cause of the failure, the committee points out that the hogging moment resulting from the distribution of ballast, fuel, etc., in the end tanks was not sufficient, in itself, to cause any failure in the hull structure. It also points out that there was no evidence of the ship having grounded on a bank of silt under the amidship portion, and none to indicate that a slight seismic disturbance, reported at the time of the failure, could have been a contributing factor to the ship's failure.

Defects rectified

All defective welding in the *Schenectady* and her sister ships has been removed, and all joints rewelded satisfactorily, as demonstrated by application of severe bending tests both in hogging and sagging.

The investigating committee was composed of the following members:

A. G. Bissell, senior welding engineer, Bureau of Ships, Navy Department; Erland D. Debes, welding engineer, Bethlehem Steel Co.; La Motte Grover, structural welding engineer, Air Reduction Sales Co.; A. A. Norton, hull superintendent, Sun Shipbuilding & Drydock Co.; Harry W. Pierce, welding engineer, New York Shipbuilding Corp.; Prof. S. H. Graf, consulting materials engineer and metallurgist, Oregon State College; also J. Lewis Luckenbach, president; D. Arnott, vice president-chief surveyor, and J. L. Wilson, assistant chief surveyor, all of the American Bureau of Shipping.

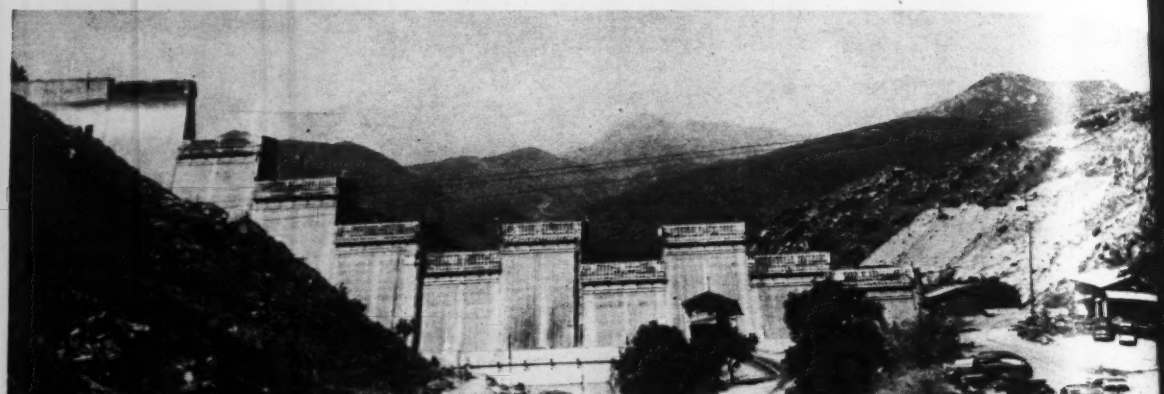
PBA seeks funds for postwar studies

A half-million dollar fund to finance design studies by the Public Buildings Administration to facilitate work after the war has been approved by the House and is now pending in the Senate. The proposed PBA work, like the highway studies now underway with a $10,000,000 fund as well as the $10,000,000 of non-federal designs being proposed to Congress by the Federal Works Agency, is directed toward quick initiation of a program of public works after the war.

The PBA plan does not contemplate preparation now of detailed plans for federal buildings to be constructed later. It is felt that there are too many uncertainties to permit doing this—uncertainties as to precise needs and even more uncertainties as to the new materials and mechanical equipment that may be available. What PBA can do, however, is keep itself abreast, or a little ahead, of changing conditions.

Therefore, if this money is made available, the PBA plans three types of activity. It will make studies in communities all over the country of the need for federal buildings. Also, it will undertake a continuing research job on new materials such as plastics and light metals that probably will be available for building when the war is over. Their usability, of course, will depend very much on price—a factor that cannot be determined until the time comes—but if performance data is at hand new products can be put into use more quickly.

The third element in the proposed program is the actual preparation of design details of an architectural and mechanical nature. This would go into such things as the proper sizes of elevators and escalators, the design of doorframes and baseboard moldings, the handling of inside columns. Details such as this frequently take up much of the time in preparation of finished building designs, work on them now can be advantageous.



San Vincente Dam will provide more water for San Diego

Additional storage for San Diego's water system will be provided by the straight, gravity-section concrete dam on San Vincente Creek on which construction reached virtual completion on March 16, when a civic ceremony was held to witness pouring of the last bucket of concrete. Although only 190 ft. high at present, the plan is to raise the height to 300 ft. when construction for this additional storage capacity is justified. When the height increase is made, the additional concrete is to be put on the downstream face. The road shown going through the dam has now been moved to higher ground.

Placement of the concrete was made with 8-cu. yd. buckets on an overhead cableway system that reached all parts of the dam except a small portion at the east end for which concrete was handled by a stiffleg derrick. The structure was built up in 5-ft. lifts in the customary 50-ft. blocks with form panels of the cantilever type.

Concrete aggregate sizes ranged up to 6-in. cobbles; 9.9 bbl. of cement per cubic yard was used. Gravel was trucked for a distance of about a mile, washed and dumped in small stock piles just below the dam where a series of six conveyor belt flight delivered to the mixer plant high up on the left bank. Here two 4-cu. yd. mixers delivered an average of about 1,000,000 cu. yd. in an 8-hr. shift.

Cold water was not piped through the dam to carry off heat during setting, but an ammonia-cooling plant during hot weather reduced to 42 deg. F. the temperature of water put into the concrete mixer. With type IV low-alkali cement, 90 hr. was required between 5-ft. li... With temporary use of type II cement, du... war requirements, 6 days is required betw... lifts except near the top of the dam where... 3-day time interval is permitted.

Contract for construction of the dam ... held by the L. E. Dixon Co.; Julius P. Will... is construction engineer for the contractor. ... contract is for $1,745,907, in addition to wh... cement is furnished by the city. Construct... started Nov. 3, 1941.

Fred D. Pyle is the hydraulic engineer ... charge of water development and conservati... for the city. Paul Beermann is engineer ... hydraulic design and construction, and C... P. Williams is resident engineer. Designs ... the dam were prepared under the direction ... Mr. Pyle with Julian Hinds as consultan...

Narrows Tunnel proposed for postwar construction

Construction of the long projected vehicle tunnel under the Narrows at New York has been recommended to Governor Thomas E. Dewey by William H. Friedman, commissioner of the New York City Tunnel Authority. The authority finds that construction of a vehicle tunnel under the Narrows to connect Brooklyn and Staten Island is practicable and that it will materially improve transportation facilities in the New York metropolitan region. The tunnel authority is building a vehicle tunnel from the lower end of Manhattan Island to Brooklyn, work being held up by the war. Using that tunnel and the projected Narrows tunnel, vehicle time can be cut from about 30 min. now required to reach Staten Island by ferry to 16 min. The tunnel would open a new through route from Brooklyn to New Jersey shore points via Staten Island and the Outerbridge Crossing at Perth Amboy.

The current studies were financed by an appropriation of $50,000 made by the state legislature last year. The commissioners now seek additional funds to complete the preparation of plans and specifications, as the start of work can be advanced about one year by such action.

The proposed connection between Brooklyn and Staten Island, including plazas, approved roads and tunnels, would be 13,300 ft. long, of which 9,635 ft. would be twin tunnels with two roadways each. The land tunnels would be shield driven, and the underwater portion would be built of sections constructed on land and each sunk in a prepared trench. These sections will be covered with a clay blanket and rip-rap. A clear channel depth of 80 ft. is to be provided.

The cost is estimated at $70,000,000 and construction is expected to require four years. About 200 engineers and 2,000 workmen will be required on the site, a total of 16,000,000 man-hours of employment, plus 40,000,000 man-hours for manufacture and transportation of materials and equipment.

Operating costs are set at $620,000 the first year, rising to $780,000. No estimate of income is given.

Conservation book on construction equipment

Associated General Contractors of America, Inc., have issued an 80-page book, *Conservation of Construction Equipment and Facilities*, as an aid in the war effort. Of convenient pocket size, the book is designed for use by key men directly responsible for the operation and maintenance of equipment and critical materials.

The opening chapter presents suggestions for laying out a construction project so as to conserve manpower and economize in the use of critical materials, followed by chapters on construction equipment, which present basic principles governing use, care and repair of equipment.

The book can be secured from Associated General Contractors of America, Inc., Munsey Building, Washington, D. C.

$3,000,000,000 roadbuilding plan proposed for the postwar period

A study by the A.R.B.A. of the nation's economic welfare indicates that from $12,500,000,000 to $15,000,000,000 should be spent annually on construction following the war.

An annual road-building program totaling $3,000,000,000 will be an essential part of this nation's postwar economy, according to a study just completed by Charles M. Upham, engineer-director, American Road Builders Association, and Daniel R. Lamson, research engineer for the association. This should be supplemented by an airport and public-works program totaling $2,000,000,000, according to this study, thus giving a total public-construction program of $5 billion.

High national income

The A.R.B.A. study is based on the assumption that a sound national economy in the postwar period will call for an annual national income of at least $100,000,000,000. On the basis of past experience, from 12 to 15 percent of the national income has been invested in construction in prosperous periods, which would indicate that the total construction budget in the postwar period should be between 12½ and 15 billions. The A.R.B.A. study estimates that a total expenditure of $15,200,000,000 would be divided as follows: residential building (private) $5,200,000,000; factory and public utilities (private), $2,000,000,000; other private construction, $3,000,000,000; highways, $3,000,000,000; other public construction, $2,000,000,000.

In order to insure that made work will not be necessary in the period immediately following the end of hostilities, the A.R.B.A. study stresses the importance of advance preparation of plans and specifications for needed highway work, also the acquisition of rights-of-way for new highway projects. To this end it urges that the $10,000,000 authorized by Congress under the Defense Highway Act of 1941 for advance surveys and plans be increased to $75,000,000. Congress also is urged to authorize appropriation of at least $500,000,000 annually in the years immediately following the cessation of hostilities for federal aid to highway work, also to authorize the Federal Works Administrator to acquire rights-of-way for desirable projects. A further proposal is the establishment of a fund of at least $500,000,000 to be made available to cities on a loan-and-grant basis similar to that of the PWA to facilitate the construction of arterial highways through metropolitan regions.

A highway program of $3,000,000,000 would mean practically doubling the annual rate of highway expenditure during the past decade, including the money spent on highways by the relief agencies. Federal, state and local expenditures on highways, exclusive of relief expenditures, have not exceeded $1,000,000,000 since 1931.

The report emphasizes the importance of being prepared to carry out highway construction in the postwar period on a contract basis in order to take advantage of the economies that are inherent in that system.

• • •

WPB stops projects totalling $1,325,306,000

Construction projects having a total cost of $297,000 were stopped during the week ended March 12, the War Production Board announced. It was second smallest weekly total reported since the Facility Review Committee was established in October last to examine the relationship of construction projects to the war effort. The above figures, covering the cost of only two projects, brings to $1,325,306,008 the total cost of all projects which have been stopped since Oct. 23, 1942, by either the War Production Board or the programming agency.

• • •

Construction declines for fifth consecutive month

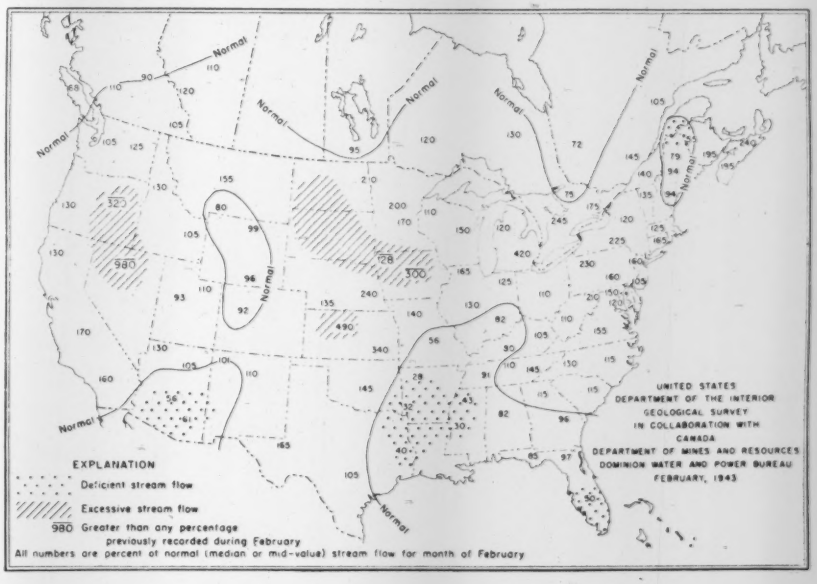
The total volume of construction in the United States declined 14 percent from December to January as the downward trend continued for the fifth successive month, the War Production Board announced on March 20. It is estimated that about 80 percent of this volume was for war purposes, as compared with about 65 percent for January 1942.

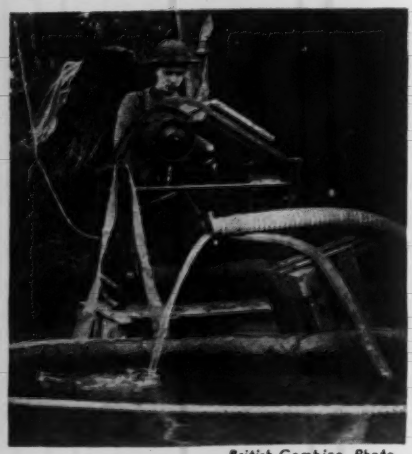
The January volume of $783,500,000 represents a 46 percent drop from August, 1942, the peak month of last year, when construction reached a total of $1,468,000,000. Construction in December, 1942, totaled $912,000,000.

Stream flow above-normal for February in power-producing areas

Most of the important power-producing areas, except Maine and Alabama, had the benefit of above-normal stream flow in February, which was registered in 75 percent of the territory in the United States and Canada.

Highlights of February conditions were: (1) The generally favorable country-wide pattern of groundwater conditions was continued, with marked increases in the New England States and along the Pacific Coast, especially in southern California; groundwater levels receded in the Gulf States from Florida to Louisiana and in Arizona; (2) water content of snow was above normal in New England and greatly above normal in most of northern New York, (3) prospects seem bright that with normal precipitation the spring runoff will be normal in the Northeastern States, with the possible exception of northern Maine; (4) storage for power, irrigation and municipal water supplies is good.


Normal
EXPLANATION
Deficient stream flow
Excessive stream flow
980 Greater than any percentage previously recorded during February
All numbers are percent of normal (median or mid-value) stream flow for month of February
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
IN COLLABORATION WITH
CANADA
DEPARTMENT OF MINES AND RESOURCES
DOMINION WATER AND POWER BUREAU
FEBRUARY, 1943



British-Combine Photo.

Purifying water supply on the Tunisian front

Information accompanying the above picture from the British War Office, states that "It is the practice of the enemy in Tunisia to poison all sources of water supply on retreating," which means that all wells must be carefully tested and the water purified before consumption. This picture shows one of the many British mobile water supply units operating in North Africa, treating water with the aid of filters. After the water has been treated it is then run into storage tanks and is pumped from the tanks into the water lorries.

State officials will direct equipment pooling

Under the road machinery and equipment pooling program of the governmental division of the War Production Board (*ENR* March 4, 1943, p. 321,) direction of operations, and shifting of equipment to meet pressing needs in various sections of each state rests entirely with state-appointed officials. The plan as set up in Iowa, which may be taken as an example, works as follows:

The state highway commission, acting as coordinator, has asked each county engineer and city engineer to report on two situations. First, the commission wants a tabulation of all surplus equipment, particularly that which is motor-powered, such as trucks, tractors, motor-graders, tractor scoops, crushing and screening plants and other machinery, listed according to type, size and condition. Second, information is wanted on equipment which the county or city needs, listed according to type and size, with a statement indicating whether the reporting agency wishes to rent or purchase such equipment. Thus surpluses and deficiencies can be matched and equipment made widely available.

News of the Week
Continued on p. 98

JOBS OF THE WEEK

AVIATION FACILITIES, Glenview, Ill.
Bureau of Yards & Docks, Navy Dept., Washington, D. C., awarded contract for aviation facilities to Standard Paving Co., White Consolidated, Inc., and Midwest Construction & Asphalt Co., Chicago, Ill. Cost placed at $1,534,300.

FACILITIES, Hawthorne, Nev.
William P. Neil Co., Ltd., Los Angeles, Calif., has been awarded contract by Bureau of Yards & Docks, Navy Dept., Washington, D. C., for additional facilities at Naval Ammunition Depot. Cost $3,203,300.

PLANT, Texas
Defense Plant Corp., Houston, awarded contract for armament plant to Southwestern Construction Co., Houston. Estimated cost $1,250,000.

HOSPITALS, Vallejo, Calif.
Public Buildings Administration, Washington, D. C., received lowest bid on two hospitals from Barrett & Hilp, San Francisco, at $1,070,000. D. D. Stone and L. B. Mulloy, San Francisco, are associated architects.

HOUSING, Alexandria, Va.
Graham Brothers, Richmond, Va., awarded contract for dormitory buildings at Arlington Farms, for U. S. Navy by Public Buildings Administration, Washington, D. C. Estimated cost $1,720,000.

IMPROVEMENTS, Oklahoma
Texas Bitulithic Co., Dallas, Tex., awarded contract for improvements by U. S. Engineers, Denison, Texas, at cost of $1,680,000.

PIPE LINE, North West Territories and Yukon.
Dominion of Canada will construct by day labor 460 miles of pipe line to connect oil well at Fort Norman with Whitehorse. U. S. Government will help finance. Estimated cost $3,000,000-$3,500,000.

IMPROVEMENTS, Ohio
U. S. Engineers, Huntington, W. Va., awarded contract for air depot construction in Richland County, to H. Kaplan Co., Chicago. Cost to exceed $1,000,000.

IMPROVEMENTS, California
Bureau of Yards & Docks, Navy Dept., Washington, D. C., will build improvements in Santa Clara County, to cost $1,442,500. Earl W. Hepple, San Jose, and J. H. Pomeroy Co., Inc., San Francisco, are contractors.

DWELLINGS, San Bernardino, Calif.
McCray-Joosten Building Corp., Bellflower, will construct by own forces three hundred sixty-three dwellings. Estimated cost is $1,250,000. Walker & Eisen, Los Angeles, Cal., are architects.

HOSPITAL, Michigan
U. S. Engineers, Iron River, Mich., awarded contract for construction of hospital recreation building, covered walks and utilities, Chippewa County, to A. H. Prokesch, Iron River, Mich. Estimated cost $1,000,000.

BUILDING, Rome, Ga.
U. S. Engineers, Atlanta, Ga., awarded contract for the construction of building to Algernon Blair, Decatur, Ga. Cost to be less than $2,000,000.

STEAM POWER PLANT, St. Paul, Minn.
Northern States Power Co., St. Paul, Minn., awarded contract for steam power plant addition, near High Bridge, to F. J. Romer Construction So., St. Paul. Estimated cost $4,000,000.

HOUSING, Wilmington, Del.
Public Housing Authority, Washington, D. C., received lowest bid from Hadley Contracting & Construction Co., Philadelphia, Pa., for housing $1,248,000. G. Morris Whiteside, Wilmington, Del., is architect.

PLANT, Texas
Defense Plant Corp., Washington, D. C., will erect chemical plant additions and facilities, by force account. Estimated cost is $1,750,000. Monsanto Chemical Co., St. Louis, Mo., will operate.

Note—Additional bidding and contract news on many projects large and small appear in the Construction News section beginning on page 133.

OBITUARY

Vidal, head of the Concrete and Laboratories of the U. S. Bureau clamation, died in Denver, Colo- on Mar. 14. Mr. Vidal was par- ly well known in the field of con- technology and had served the for 18 years in addition to hold- hemical positions with the Ameri- melting and Refining Co., Colorado Highway Department, the Denver way Co., A. A. Weiland Engineer- o., and the Denver Municipal Water s. Born in Denver in 1901, Mr. obtained his common and high education in that city and his ssional training in the University olorado and the Colorado School ines.

. Fritch, who served as secretary e American Railway Engineering ciation from 1906 until his retire- in 1937, died at South Bend, Ind., 18, aged 82. Mr. Fritch began his ay service in the traffic department e B. & O. In 1900 he became tant secretary of the American Rail- Engineering and Maintenance Asso- on, now the A. R. E. A.

e Harold Dodd, 54, district engi- of the St. Louis branch of the rican Institute of Steel Construction, Mar. 14. Mr. Dodd, a graduate e University of Kansas, had previ- served eight years as the Institute's ict engineer at Dallas, Tex.

ert C. O'Neel, 78, who was famous construction engineer in Alaska years ago, died in Portland, O., Mar. 12. In later years Mr. O'Neel tructed Portland's airport, and was stant engineer in construction of neville Dam. In Alaska he built Copper River & Northwestern Ry. ough 196 miles of wild country.

d F. Busacker, Sr., 89, building con- tor in Milwaukee, died Mar. 7.

orge MacKay, 83, engineer and archi- of Ocala, Fla., died there on Feb. Mr. MacKay designed and built ny of the mining plants erected in t part of Florida when the hardrock sphate industry flourished.

rren Holt Tonkin, 38, district plan- g engineer for Division No. 11 of Ohio State Highway Department, d Mar. 8, at New Philadelphia, O.

n Debo Galloway, 73, connected th nearly every major engineering ject in northern California in the last 40 years, died at Berkeley on Mar. 10.

Wilbur C. Cone, prominent Oakland, Cal., building contractor, died there Mar. 5.

Coles A. Raymond, 72, structural engineer, died Mar. 11 in Columbus, O. He was graduated from Ohio State University in 1894.

Paul D. Cook, 59, city engineer of Sioux City, Ia., died recently. He had been city engineer since 1934.

John G. Quinn, Lake Charles, La., representative in southwest Louisiana for the State Department of Occupational Standards, and acting secretary of the General Contractors Association of Lake Charles, died recently.

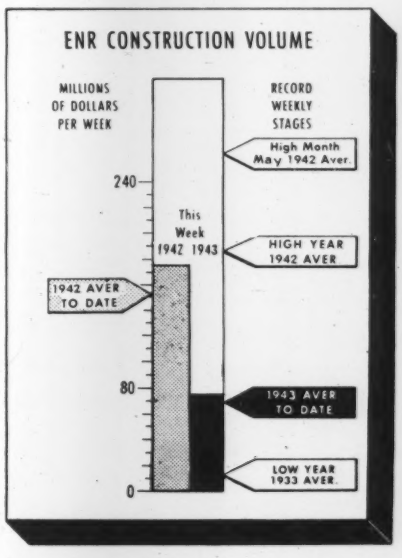
Edward Kessing, 89, former well known road contractor in southern Indiana, recently died in Indianapolis, Ind., where he had lived since his retirement.

John Sixten Jonsson, 60, chief structural engineer for Graham, Anderson, Probst & White, Wheaton, Ill., died March 14 in Hastings, Neb., where he was supervising the construction of a naval depot.

CONTRACTS AND CAPITAL

CIVIL ENGINEERING construction volume for the week totals $74,130,000, an increase of 33 percent over the preceding week, but 58 percent lower than in the corresponding 1942 week. Private construction is 254 percent higher than a week ago, and public work is 14 percent higher as a result of the increases in state and municipal, and federal work. Comparisons with the week last year, however, reveal private work 21 percent lower, and public construction down 63 percent. Federal volume is 63 percent below a year ago, and state and municipal is off 59 percent.

The current week's construction brings 1943 volume to $839,041,000, an average of $69,920,000 for each of the twelve weeks. On the weekly average basis, 1943 construction is 54 percent below the $1,993,088,000 reported for the thirteen-week period last year. Private work, $82,042,000, is down 53 percent, and public construction, $756,999,000, is 55 percent lower when adjusted for the difference in the number of weeks.



In the classified construction groups, gains over last week are in waterworks, sewerage, industrial buildings, commercial buildings, earthwork and drainage, streets and roads, and unclassified construction. Increases over the 1942 week are in commercial buildings, earthwork and drainage, and unclassified work.

New capital for construction purposes for the week's totals $3,404,000, 54 percent lower than in the week last year. The week's new financing is made up of $1,250,000 in corporate security issues, and $2,154,000 in state and municipal bond sales.

New construction financing for the year to date, $62,718,000, compares with $1,419,454,000 reported for the thirteen-week period a year ago.

CONTRACTS

(Thousands of dollars)

	Week Ending Mar. 26 1942	Mar. 18 1943	Mar. 25 1943
Federal	$146,652	$49,276	$54,069
State & Municipal	10,620	1,914	4,356
Total public	$157,272	$51,190	$58,425
Total private	19,843	4,444	15,705
TOTAL	$177,115	$55,634	$74,130
Cumulative 1943 (12 weeks)			$839,041
Cumulative 1942 (13 weeks)			$1,993,088

Note: Minimum size projects included are: Waterworks and waterways projects, $15,000; other public works, $25,000; industrial buildings, $40,000; other buildings, $150,000.

NEW PRODUCTIVE CAPTIAL

	Cumulative 1942 13 weeks	1943 12 weeks
NON-FEDERAL	$177,499	$62,718
Corp. Securities	60,410	1,250
State & Mun.	101,840	56,880
R.F.C. loans	15,249	1,500
FPHA loans	.....	3,088
FEDERAL	$1,241,955	.....
TOTAL CAPITAL	$1,419,454	$62,718

ENR INDEX NUMBERS

Index Base = 100

		1913	1926
Construction Cost	Mar. '43	285.24	137.11
Building Cost	Mar. '43	226.66	122.53
Volume	Jan. '43	231	101

FHA MORTGAGES

	Week Ending Mar. 21 1942	Mar. 13 1943	Mar. 20 1943
Appraisal Selected for			
Title II	$17,470	$5,352	$——*
Title VI	$20,128	$15,807	$——*

* Not yet available.

Comment and Discussion

Readers' opinions on matters that concern engineers and contractors

Highway Maintenance Costs

Sir: I have just read on p. 73 of the Jan. 14 issue, your digest of "Highway Maintenance Costs," the paper recently presented by me at the St. Louis meeting of the Highway Research Board, and thank you for doing a splendid job in a few words. It is believed, however, that I should mention the two errors that appear in the table "Summary of Annual Highway Maintenance Costs per Mile and Prevailing Factors Affecting Maintenance Costs" as reproduced at the bottom of this page. These are, (1) Traffic service including snow, ice, and guardrail, under "West North Central Region," should read $95 instead of $895; (2) Overhead, under "Mountain Region," should read seven percent instead of eight percent.

H. K. BISHOP,
Chief, Division of Construction,
Public Roads Administration,
Washington, D. C.

MPR 251 Is Unworkable

Sir: OPA Regulation MPR 251 is the construction industry's price ceiling order. The Associated General Contractors of America, Inc. has opposed this regulation in its present form and as a last resort has entered a protest and asked for a hearing in the name of 21 of its members, all of whom are outstanding firms in the industry. Their protest asks for the rescinding, recall and suspension of the regulation for reasons stated in this petition.

The Constructors Association of Western Pennsylvania, also representative of firms in this industry, has given serious consideration to this regulation and has also filed a protest with OPA. In endeavoring to secure a clarification of this regulation we have received various interpretations from OPA, all at variance with what the regulation seems to infer. This regulation was put out in its present form without consultation with representatives from the general contractors in spite of the statement to the contrary, and is, in the opinion of our people, ill-advised, of no value, and unworkable.

Quoting from a paragraph of a letter sent to OPA in reply to the answer to our protest, the letter states: "If this regulation is so written as to be susceptible of various interpretations other than those intended by OPA, it is an indication that the regulation is poorly written in the first place, and being susceptible to various interpretations is a very dangerous regulation to put out as applying to the second largest industry in the United States, if it were to come before the courts."

Again, as we are in a most serious situation in regard to a war, it seems to the writer that there are two questions to be asked and answered in the affirmative, which should govern the acts of Congress and governmental administration bodies, and if any act or regulation cannot be answered in the affirmative it should be laid aside at least for the present.

The questions are:

1. Will it further the war effort?
2. Will it prevent inflationary tendencies?

Such questions respecting MPR 251 must be in the negative, in the opinion of a large cross-section of the construction industry.

ROY A. MACGREGOR,
Executive Secretary
Constructors Association of Western Pennsylvania
Pittsburgh, Pa.

No Federal Aid

Sir: It is noted with dismay that President Roosevelt is recommending "that federal aid ought to be provided" for preparation of detailed plans and specifications for local public works construction in various states and cities to avoid a great postwar delay in providing jobs for men leaving the armed services and war industries.

Looking back on the past ten-year period, in the writer's opinion a greater volume of public works construction has been prevented and discouraged by the mere continuing [illegible] istence of the various federal aid [illegible] grams than was created dir[illegible] thereby. The engineering profes[illegible] and millions of co-workers in the [illegible] struction industry were degraded [illegible] a vicious system of political con[illegible] Must we return to such a system [illegible] the postwar period?

What will the men of our fight[illegible] forces have to say when they [illegible] turn and find that the best we co[illegible] do in their absence was to plan a [illegible] system of regimented work?

The states, cities and many s[illegible] communities should be encouraged [illegible] assume a responsible part in post[illegible] planning activities. However, if [illegible] encouragement takes the form of [illegible] eral aid, it is believed that the fail[illegible] revealed by past experience [illegible] similar programs will be repeated.

HERBERT Moo[illegible]
Consulting Engi[illegible]
Milwaukee, W[illegible]

"Pressures in Pneumatic Tires"

Sir: Re your correspondence [illegible] tire manufacturers about the [illegible] item on page 96 of *ENR*, Nov. [illegible] 1942, you are at liberty to say that [illegible] am the contractor who advoca[illegible] higher tire pressures.

For many years it has been stan[illegible] ard practice in my organization [illegible] keep all our truck tires, carryin[illegible] scraper tires and tires on other equi[illegible] ment "overinflated," as some t[illegible] companies rate it. Even on my ow[illegible] passenger car I customarily carry [illegible] to 38 lb. against the manufacturer[illegible] recommended 28 to 30. As a result [illegible] have consistently obtained 30,000 t[illegible] 35,000 miles on passenger car tire[illegible] much more than I would with t[illegible] lower pressures they advise.

I know positively that we hav[illegible] saved many thousands of dollars b[illegible] following my plan on construction [illegible] equipment instead of using the low[illegible] tire pressures some tire companie[illegible] recommend. The lower pressures per[illegible] mit excessive flexing of side walls an[illegible] result not only in blowouts but caus[illegible] overheating that produces excessiv[illegible] wear in highway transport service.

Some tire manufacturers are un[illegible] reasonable about these tire pressures. [illegible] It is true that lower tire pressures wil[illegible] make your car ride easier but these [illegible] low pressures will increase your gaso[illegible] line consumption and your tire wear. [illegible] This tire wear has enabled the tir[illegible]

panies in the past to enjoy a her replacement business than would have enjoyed if they had ommended in the beginning the pressures that would have given ximum wear. It is time for us to get these soft rides and get tough- up to the ugly facts out in front us, and if these tire companies wish render a patriotic service in the esent emergency they should forget me of their fancy theories and opt the practice that we hardboiled ntractors have had to learn the rd way.

CLYDE W. WOOD
Clyde W. Wood, Inc.
General Construction
Los Angeles, Calif.

Staggered Rail Joints

Sir: Right now is a fine time to ink about discontinuing the custom staggering rail joints in railroad rack. Since engineers are partly re- ponsible for this practice, perhaps ngineers will do something to put an nd to it. Those of us who buy trans- ortation on passenger trains really re entitled to a smoother ride than afforded by many of our present- ay tracks.

The staggering of rail joints is a actor which indicates that some rail- oad men, many of whom are engi- neers, have been a trifle lax in apply- ng their usual dependable judgment o this detail of their track. It seems o be a "standard" way of laying teel, revered on account of its ven- rable age. So the railroads continue he practice of placing each rail joint exactly opposite the center of a rail over on the far side of track in com- plete disregard of the objectionable results. This is just another case of, "That's the way it's always done, so that's the way to do it."

The argument in favor of staggered joints is this. There is, at all points, at least one continuous rail to give the track lateral strength and hold it in line.

The logical question then is, Does this keep the track straight? And the only proper reply must be: Instead of holding it straight, staggered joints cause forces that definitely throw it out of line.

During an early period of my own work, I was foreman of a large float- ing gang laying steel, building side- tracks, and handling other heavy jobs on a railroad in Wyoming. The offi- cials were engineers of long experi- ence, while my own engineering diploma still was quite conspicuous in the top of my trunk. Having learned about such track matters from observation and from older track men, I voiced my protest. However, I had to obey orders and stagger the joints in strict accordance with orth- odox practice. Other foremen still are doing it that same way, and probably for no better reason.

One bad result of this faulty prac- tice is its effect upon foremen who know better. It reduces their respect for officials. A minor effect is the slight added cost of cutting at least one rail near each switch or crossing. The principal fault lies in the in- creased side sway of trains due to the low spots of the track being so located that they sometimes tune in with, and greatly aggravate, the rocking of cars. This increases the wear on both track and rolling stock and also boosts the cost of track surfacing.

In spite of all the many efforts to devise splice bars that will give rail joints sufficient beam strength to eliminate the extra burden upon joint ties, we still have low joints except where track maintenance is of a high order. If rail joints were "even" in- stead of staggered, they would cause only vertical vibration of cars. But staggered joints produce just as much vertical motion as do "even" joints and also cause increased impact and side thrust due to the aggravated rocking of cars. The result is an in- creased tendency to hammer the joints down below the proper surface. The side thrust also tends to throw each joint outward, and poorly maintained track sometimes takes upon itself an ugly snake-track aline- ment. Even joints provide a better riding condition and eliminate a con- siderable amount of wear.

Some of the extremes to which the railroad profession has carried the practice of staggering rail joints are these. On New York elevated rail- roads the ties are bolted to the rigid steel girders, and yet the rails are cut near switches so that the joints may be staggered. On some draw bridges, where the rails are bolted directly to solid steel floor plates and where there is no influence from joint locations out on land, the joints are staggered in true conformity with the standard method. On certain track in some harbor work, where the rails are bolted to the tops of immense dock walls, the joints were religiously stag- gered even though this required sev- eral cuttings of very heavy rails. Surely these instances point to a blind following of custom, much the same as is the case out on regular stretches of otherwise good track.

When the war is over and more labor is available for track mainte- nance and when new steel is to be had for the inevitable very extensive replacement needs, possibly we can expect railroad officials to relax a bit and let their foremen make them some really good track that will have a fair chance to save some money by stay- ing good. That would be a fine time to make the change, there then being so much activity in the laying of new steel.

LEONARD C. JORDAN.
New Rochelle, N. Y.

Sampler for Soft Soils

Sir: Trent R. Dames, in his letter published in *Engineering News-Rec- ord* Dec. 31, 1942, p. 762, comment- ing on my article describing a new sampling spoon for soft and sandy soils developed by New York City's Department of Public Works (*ENR*, Aug. 27, 1942, p. 308), expresses preference for a sampler of his own design that he has used for several years. His criticism of the New York sampler relates particularly to the de- tails of the closing device.

My own belief is that the most effi- cient gravity-drop devices for clos- ing a sample spoon are of the leaf, or flap valve type, similar to the foot valve of a pump. If a closing device does not close by force, it will not be grain-tight, and many of the ma- terials will wash out of the sampler. This occurs daily in our experience with sands and soft silts. It is pre- cisely for this reason that the spring closing device was used on the New York sampler.

As to the delicacy of the closing device we are experimenting with, that is unavoidable. Neither we nor anyone else familiar with test-boring work would think of using such a de- vice in any hard driving. Its desira- bility is restricted to the limits of soft and incohesive materials, and such materials do not damage the spring leaves.

Of course, we have much more ex- perimental work, which has had to be postponed for the present, ahead of

us, covering weight and tension and shape of spring leaves, especially for larger sizes of spoon.

As to the set screw shown in our photograph, which retains the spring dome in the tip, Mr. Dames must have guessed that it broke about the third time we put down the spoon. It was supposed to be a button-head screw, and that type was put in the spoon as soon as the first makeshift broke.

With regard to the wall thickness of sampling devices, it is merely an accident that commercial samplers for sale in New York have somewhat thicker shoes than those illustrated as in use by Mr. Dames' firm. They could be made thinner, and would be, if we were redesigning the whole spoon.

HENRY D. HAMMOND
Department of Public Works
New York, N. Y.

Engineers in Federal Service

Sir: It is reported that there is a shortage of trained engineers. It is regrettable that no late statistics pertaining to the number of engineers in the federal civil service are available, but a suggestion can be made that this number runs well into five figures.

Although it is realized that mistakes have been made (and perhaps the most important one was made right in Washington by building up a large, cumbersome, administrative machine), it is not the purpose of this writing to criticize the present administration. The intent is to show that it is possible to reduce the number of engineers in civilian activities of the federal government and make available to private industry a large number of engineers, and at the same time to promote efficiency and economy within the government.

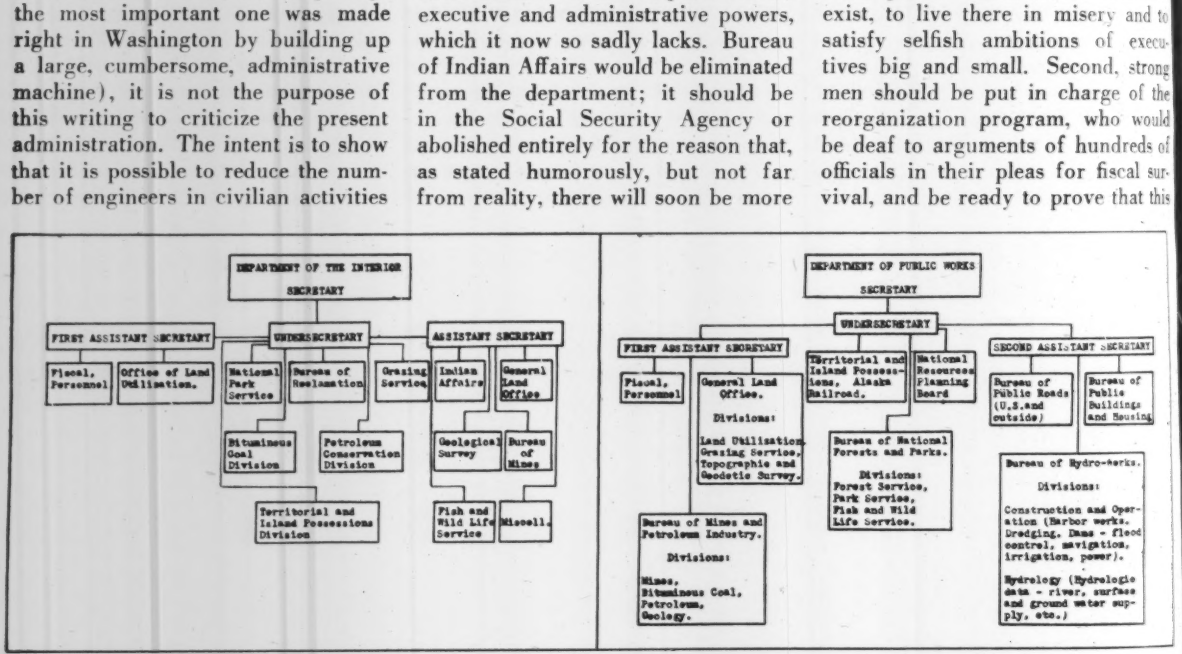
For illustrative purposes the organization chart of the Department of the Interior as shown at the left in the accompanying diagram may be used. This department has been selected in order to illustrate that presentday governmental activities outgrow the designation and purpose of the old departments. In the case of the Department of the Interior this is especially pronounced. Even its name has lost its meaning, and a better designation of the department is desirable.

The organization chart of a reorganized Department of the Interior under a more appropriate name—Department of Public Works, is shown at the right in the accompanying diagram. It reveals that the reorganized department has absorbed most of the engineering activities of the government. Many independent agencies are abolished by bringing their function into the department; many bureaus are consolidated and some are decentralized, and their divisions put in the appropriate bureaus. Some bureaus are transferred from other departments. National Resources Planning Board by such transfer would acquire certain executive and administrative powers, which it now so sadly lacks. Bureau of Indian Affairs would be eliminated from the department; it should be in the Social Security Agency or abolished entirely for the reason that, as stated humorously, but not far from reality, there will soon be more employees in the Bureau of Indian Affairs than there are Indians in the country.

Savings in both manpower and operation cost as a result of the hypothetical reorganization are large. It is difficult to estimate exactly how many engineers would be available for other duties through this reorganization, but it is safe to state that the cost of operation of all activities involved would be reduced at least 40 percent.

Naturally, similar reorganization could and should be effected in all other federal departments, in which case the total expense of operation of the regular departments would be reduced by about 2½ billion dollars. If the same ratio is applied to the military establishments and civilian agencies created in connection with the war effort, provided they undergo drastic and efficient reorganizations, it is believed that the problem of running a huge public debt would be of secondary importance.

Two items are necessary to accomplish this. First, elimination of the Civil Service Commission's practice of rating positions on the basis of the number of employees subordinate to that position. At the present time this practice is responsible for the steady stream of clerks and other employees leading to Washington and other places where federal activities exist, to live there in misery and to satisfy selfish ambitions of executives big and small. Second, strong men should be put in charge of the reorganization program, who would be deaf to arguments of hundreds of officials in their pleas for fiscal survival, and be ready to prove that this



How the Department of the Interior (charted at the left) could be reorganized and renamed the Department of Public Works (right), with resultant savings in manpower and money as well as an increase in efficiency.

ntry will exist quite safely with- many current governmental ac- ities. Whether this will ever be omplished only time will show.

JAMES S. SWEET
Douglaston, N. Y.

oods on the Tennessee

Sir: The accompanying statement, Flood Controlled in the Tennessee alley," was prepared by Mr. Nich- s W. Bowden, principal hydraulic gineer, Tennessee Valley Author- . This material may be of interest many engineers to supplement in- rmation appearing in *ENR*, Jan. 7, 943, p. 3, concerning floods on the hio River.

"The storm which produced the ood in the Ohio River late in De- ember and early in January first ruck the Tennessee Valley where, ver a period of about three days rom Dec. 27 to 30, heavy general ains occurred over the entire basin nd very heavy rains over the south- rn, middle, and southeastern por- ions. In the southern section of the asin, in north Alabama, the total mount of rain varied from about 3 o 9 in.; in the middle section, from bout 5 to 7½ in., and in the south- astern section, from about 5 to nearly 2 in. In the remainder of the basin he amount was generally from 2 to in.

"The extremely heavy concentra- ion of precipitation at and within a undred miles or so above Chat- anooga produced run-off sufficient to ave caused a stage of 39.7 ft., nearly 0 ft. above flood stage at Chatta- nooga, but the operation of the sys- em of TVA reservoirs above Chat- anooga, including Norris, Cherokee, Hiwassee, Watts Bar, and Chicka- mauga, reduced the natural crest to a tage of 35.8. This reduction of the rest to a stage at which there was elatively minor damage is estimated o have prevented damage in the city mounting to at least $1,000,000 and aved the possible shut-down of in- ustrial plants, some engaged in war work.

"At Knoxville, the flood crest was reduced from a probable 3½ ft. above flood stage to about 3 ft. below flood stage; at Clinton, Tennessee, on the Clinch River it was reduced by some- thing like 8 ft.; and at numerous other key or critical points through- out the valley, by varying amounts.

"In addition to the regulation of the flood in the Tennessee Valley, TVA coordinated the operation of its system of reservoirs with the floods which at that time were passing down the Ohio and Upper Mississippi Rivers by discharging the flood water from the reservoirs in the main Tennessee River as quickly as prac- ticable so as to permit withholding contribution of large flows from the Tennessee River in the event that dangerously high stages should occur at Cairo and points on the Lower Mississippi River. Fortunately only moderately high stages, not requir- ing regulation, were experienced. Throughout the flood, the authority cooperated with the U. S. Weather Bureau and the U. S. Army Engi- neers, exchanging full information on the progress of the floods and enabling computation of the time and prob- able height of the crest at both Pa- ducah and Cairo."

HARRY WIERSEMA
Assistant to the Chief Engineer
Tennessee Valley Authority

Rigid Frames Save Timber

Sir: The tables for designing rigid frames of timber made available by Jaro J. Polivka in *Engineering News-Record*, Dec. 3, 1942, p. 790, will save time for the designer who has occasion to work with this particular type of structure. However, the article did not state upon what basis the values were derived. A knowledge of the limitations involved is an essential aid in the use of any chart or table.

Using the method of the column analogy the writer checked the typical problem illustrated by the author on the assumption of constant moment of inertia throughout the members (gusset plates not acting). Results of this analysis were in close accord with those found by use of the tables. If the value of C_q is found for F_1 of 0.48 instead of 0.50, the horizontal thrust due to the vertical loading will equal 633 lb., which agrees with the reaction found by the writer. Another analysis was made using a variable moment of inertia in order to ascertain the effects of the gusset plates, which showed an increase in the horizontal thrust (for vertical loading) of approximately 11 percent.

In designing continuous members more time is usually spent in getting the structure in shape for a final analysis than in the final analysis itself. The tables published by Mr. Polivka are primarily useful as a design method. Although apparently developed for timber frames they are, of course, applicable to frames of concrete or steel. In structures of lesser importance, the error resulting from neglecting the effects of the gusset plates does not seem objectionable. Where the size and importance of the structure warrants, a more exact analysis is indicated.

The use of wood in rigid frames leads to the question, how well is continuity preserved? In other words, do rigid frames of timber stay "rigid"? The writer knows of no experimental work on such frames that might substantiate the correctness of conventional analysis of continuous wood structures. From observation of old buildings, where the evidence of shrinkage and time yield is so apparent and from examination of joints made with "timber connectors," which showed signs of slip, it would seem that some change in angle at the joints of "rigid" frames of timber might be expected. The importance of being able to evaluate this angular change, if any, should be realized by every structural designer.

M. W. ROSENSTEIN
Structural Engineer
Chicago, Ill.

Lesson from Indians

Sir: In your issue of Feb. 18, on p. 263, you illustrate a "new type of portable shelter for the Army". This consists essentially of semicircular bows covered with fiber blankets. This *new* shelter is very much like the "long houses" which were used by some of the early Indian tribes in New England.

At the 1929 International Boy Scout Jamboree in England, the delegation of boys from Newton, Mass., lived in a replica of an Indian "long house" which they built and assembled in this country and dismantled for shipment to England. The structure was framed with saplings lashed together and covered with rubber impregnated fabric in lieu of the skins which the Indians used.

Truly "there is nothing new under the sun"!

ARTHUR L. SHAW,
Metcalf & Eddy, Engineers
Boston, Mass.

EDITORIALS

VOLUME 130 NUMBER 12

March 25, 1943

City Street Maintenance

WAR RESTRICTIONS on maintenance coupled with the ravages of winter have exacted a heavy toll in city pavement deterioration. In fact, if the condition of bituminous pavements along the Eastern seaboard is a criterion, a tremendous program of preventive maintenance must be undertaken immediately if municipalities are to save a major investment. Primary reason for the damage, of course, has been the restriction on use of tar and asphalt, which has virtually eliminated maintenance measures. Difficult as it may be to relax these restrictions, because oil-products transportation is still very critical, the matter does call for consideration. Prompt repair of streets will not only preserve an existing, expensive investment but will also minimize wear and tear on irreplaceable automobiles. And both streets and cars are essential to the war.

Familiarity Breeds Carelessness

THERE WAS NOTHING WRONG with the welded tanker *Schenectady*, which broke in two at her dock in Portland, Ore., Jan. 16, that accepted good practice could not have avoided. That is the reassuring conclusion that may be drawn from the report of the committee of eminent welding experts appointed by the American Bureau of Shipping to investigate the accident. Further cause for satisfaction, in so far as the poor welding is concerned, would seem to rest in the fact that the work was done by an organization that knew better. Indeed, Kaiser shipyard personnel have turned out so many hundreds of miles of successful welds that over-confidence in weld strengths was probably the basic reason for the failure. It was the old story of familiarity breeding carelessness. Even as good a jointing material as is provided by modern electrodes will not hold seams that are forced into fit by jacks and turnbuckles or, failing to close up properly, are filled with an excessive amount of weld metal. Residual stresses so set up may be expected to cause trouble. In this case they caused a failure. It was as simple as that, and yet there were disquieting corollaries. The steel plate in which the fracture is believed to have origin was of low ductility and strength. The desig the welded joint that may have fractured first mitted an acute concentration of stress. There a quick drop in atmospheric temperature to b freezing at the time of the accident. All these tors have been claimed to have been present in structural welding failures. They call steel ma facturers, designers and research engineers to same bar of accounting as the fabricator. More in construction, better understanding of des clearer insight into welding phenomena gener are the demands which this tanker failure em size.

Leaderman Bottleneck

ABSENTEEISM may not deserve quite so much phasis as headlines give it. In shipyards, as other construction projects, large numbers of w ers use equipment to put materials together exactly prescribed form. One accustomed to obse ing such operations will note that the average sh yard worker does not require a high degree skill; his operations are repetitive, and the te nique is quickly learned. On the other hand, ju ment, resourcefulness and often a knowledge human nature are required of foremen who lay and direct the work. This skill cannot be so quick acquired, but upon it depends ability to anticipa and compensate for factors that control avera progress. Where leadership is below par, the r of progress will be correspondingly low despi abundance of willing workers. If training schoo for leadermen can be brought up to the efficien that many plants have already attained in teachi welding, for example, a long stride forward w have been made. A serious bottleneck is the scar ity of supervision capable of showing workers ho to get best results for honest effort.

Manuals for the Front Line

ONE of the little known publishing activiti growing directly out of the war is the preparati of detailed manuals relating to every piece of w equipment, from battleships to bulldozers. F example, a book recently completed by the Jaeg Machine Co., covering one of its pavement finishers is 6 x 9-in. size and contains 90 pages of text an diagrams. These manuals go to the front with th machine. They must, therefore, not only explai how to operate and repair the equipment, but the also must give full details as to each part so tha it can be replaced at points far from distributor warehouses. Years ago, when the Army's princip

of mobile equipment was the G. S. wagon, repair parts was no great problem. If no means were available, any enterprising could steal the missing part from another wagon. Today, with the multiplicity of nes, however, such simple measures are not ent; the men who use the machines and the officers of their units must know what replacements should be carried with the unit, what can probably be replaced in the field, and how to identify clearly parts that must be ordered for rush shipments overseas. This information these detailed manuals supply. A postwar thought is that soldiers trained in the use of such manuals will come back as construction men who know what they want in the way of good equipment.

THE TIME IS NOW

TIME to stop postwar public works planning tart designing. Such a statement may be an implification of the problem facing cities, ies, states and the federal government, but it , for that reason, untrue. In fact, simplifica- is what is needed, if the construction indus- part in postwar rehabilitation is not to go by ilt. Already there is evidence of the insidious ncy to regard planning as an end in itself, o make the plans so grandiose and complicated ebate instead of action is the only result. The example is the National Resources Planning d report that the President transmitted to ress recently. The controversies that it is sure gender may be entertaining and interesting, hey will only muddy the already still waters ut making them flow.

may be said for the NRPB, however, that it in this report its first public recognition of the that public works construction is not the sole ity available to keep our economy on an keel. In other words, that there is a limit e number of persons who can be efficiently and tively employed in governmental construction. , if it could be more generally recognized that function of public works is to give us facilities will raise our standard of living and not just ve employment, a sound basis for public works ning would be established.

is this basis that should motivate govern- t agencies now. If a city needs a sewage dis- l plant or a new water supply, it should start ctly on making construction possible. If bet- state highways are needed, design them. If d control at certain points or irrigation in cer- areas can be justified, get plans and specifi- ons ready, buy land and be ready to start truction when men, materials and money be- e available. In brief, start with physical needs, not with vague amounts of problematical unemployment. Such an approach would greatly simplify the postwar planning problem, it would be in line with the best of social objectives, and would automatically take care of as much employment as this particular governmental function can handle efficiently.

At present the principal obstacles to immediate designing of public works are psychological and political. Mostly they are based on uncertainty as to whether Congress is going to provide funds. For this reason, Congress itself should divorce the public-works question from the broader one of postwar planning, and pass legislation or appropriate funds that would permit federal departments to design work already authorized, and that would provide cities and other local governments with loans for designing work if they need them. State legislatures should follow suit in their own jurisdictions. And, finally, the state and municipalities themselves could occasionally forget federal aid, and use some of their own funds to translate planning talk into designing activity. New York City and New York State have both embraced this idea of doing something for themselves, to their great credit and advantage. Also, some states have taken advantage of 50 percent federal grants on highway design work, but, by and large the current public works planning philosophy is one of watchful waiting.

So far the delay has not been serious, and it probably was unavoidable while we were getting a war machine going. But it has always been foreseen that when war facilities were built and production was rolling there would come a time when postwar planning would have to be taken up in earnest. That time has come, but there is danger that planning talk and not planning action is what too many have in mind.

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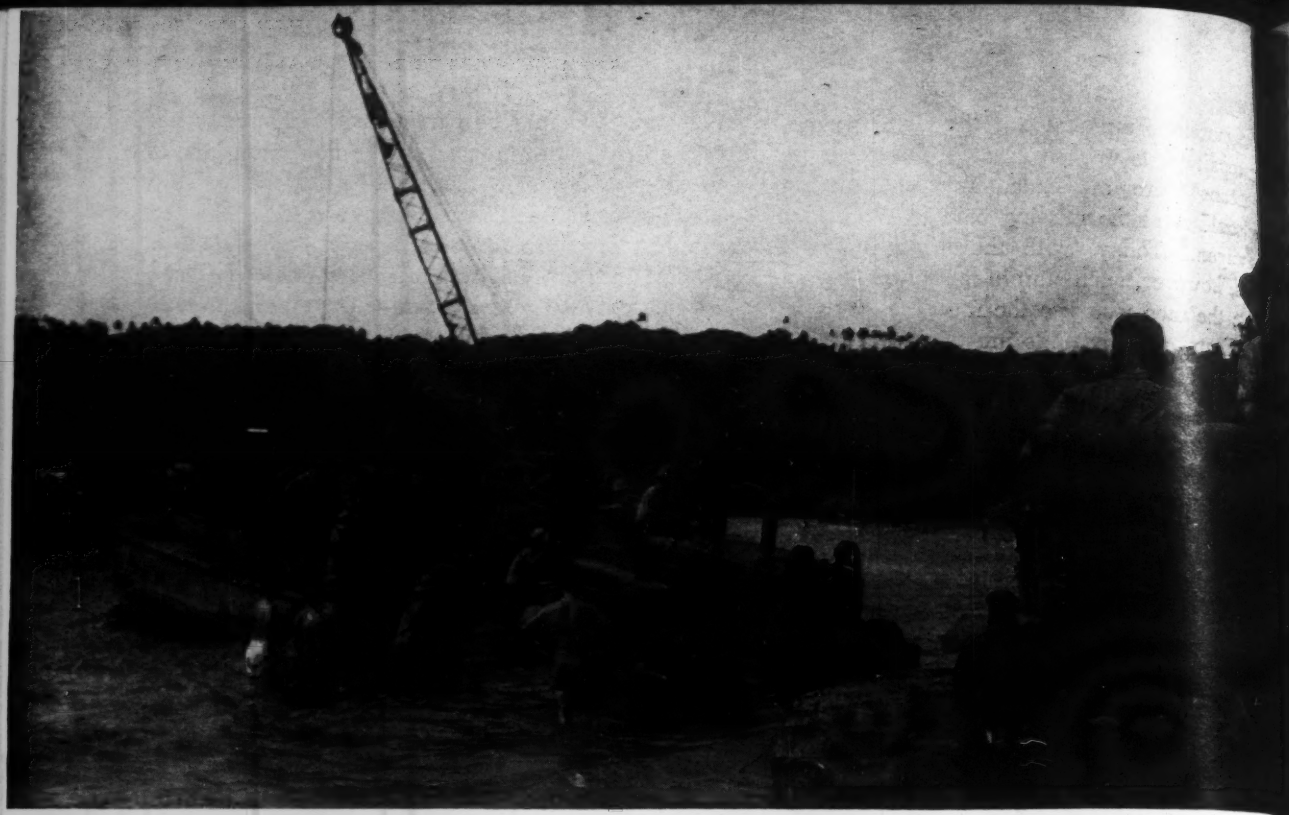


Fig. 1. Engineers of the Marine Corps establish an outpost in the South Seas.

Combat Engineers in the Marine Corps

George E. Tomlinson
Lieutenant Colonel, U. S. Marine Corps, Washington, D. C.

Relatively new and little known, the engineer services of the U. S. Marine Corps are in the thick of landing and advance operations at many points. This is an account of the training and opportunities for service with the engineer troops of one branch of our armed forces.

TO MANY ENGINEERS, the fact that the Marine Corps has an Engineer Service may be a startling revelation. It is nevertheless true and although they have not received much publicity regarding their accomplishments, Marine engineers are a vital element in the Marine Corps. What is most important and significant is that they are *combat engineers.*

The engineering work of the Marine Corps runs almost the entire gamut of military engineering. Included are stream crossings by means of fixed and floating bridges, improvised ferries, and cableways; road and airfield construction, repair and maintenance; mapping by ground and photographic methods; preparation and destruction of anti-tank obstacles; demolition work; installation, operation and maintenance of water supply and electric power facilities; camouflage; shelters, and other construction. And, of course, there is always the probability of actual conflict with the enemy.

During the Guadalcanal operations, Marine Corps engineers landed on August 7 with the first troops, and immediately relieved an infantry battalion. They held their front line position for two days and then moved inward to the airfield that has since been named Henderson Field. At that time there remained to be completed a three-foot fill over a considerable area of the principal runway. The Marine Corps engineers used trucks, rollers, electric generating plants, a water treatment plant, blacksmith shops, and miscellaneous construction items captured from the Japanese to supplement their own equipment, secured gravel from the nearby hills, and promptly finished the field. It was interesting to note that some explosive caps taken bore U. S. Naval Station markings, indicating that they had been previously captured from U. S. forces—probably at Wake Island.

While construction was being rushed to completion, Japanese aviators bombed the job regularly every day. Marine Corps engineers put the field in operation, however, and held it until a Naval Construction Battalion arrived. They then proceeded inland, building roads and bridges in the forward areas while the Seabees maintained and improved the airport.

The Marines, using a portable saw

manufactured locally much of necessary lumber. At first the ill operations were not very ssful due to the fact that so of the standing trees contained fragments of shrapnel. After a weeks, however, the sawmill was d to an area that had not been ly shelled, and it functioned factorily.

ficers and men assigned to engi- ing duties are designated "Engi- Personnel" and are assigned e their training and ability can tilized to best advantage. Engi- officers are classified in four eral groups: Construction and ntenance; mapping; camouflage; photographic reproduction.

How officers are obtained

ngineer officers are secured by motions from the ranks, from duates of the Marine Corps Offi- Candidates Class, or by special curement from civilian life. The cer candidates classes are com- sed of enlisted men who have been commended by their commanding icers for officer training and recent ollege graduates who were specially nlisted as privates first-class, and ve satisfactorily completed a seven eeks' course of basic training.

Upon completion of the candidates lass course the men are commis- oned second lieutenants and are im- ediately assigned to a course for serve officers. Here they are taught to serve as platoon leaders and com- any commanders. Qualified gradu- tes from the reserve officers classes e selected for engineer duty and esignated "Engineer Officer".

A very limited number of engineer fficers have been procured directly rom civilian life for the purpose of ringing into the Marine Corps addi- ional background knowledge in such ields as roads and airfields, stream rossings, surveying and mapping, building construction, demolition, photographic and lithographic repro- duction, water supply, and camou- lage. To qualify for an engineer ommission, direct from civilian life, he applicant should be between 20 nd 35 years of age; be in excellent physical condition; have completed four-year accredited engineering course; and have at least five years of recent engineering experience, preferably in construction superin- tendence. Following commissioning, each officer attends an indoctrination course which includes basic military exercises, procedures and regulations.

Newly commissioned engineer officers attend a course of instruction at either Camp Lejeune, New River, N. C., or Camp Pendleton, Oceanside, Calif., where they are given brief instruction in the fields of engineering in which they are expected to serve. Ordinarily, it is not feasible for officers promoted from the ranks in the field to attend this course, but all others do so in order that they not only can master certain specialties that may be new to them, but also to give them as much organizational training as is practicable.

All Marine Corps enlisted men undergo seven weeks of basic training at Parris Island, S. C., or San Diego, Calif., during which time they are taught the fundamentals of amphibious warfare, with special emphasis on the effective use of weapons. (These are the same recruit depots, or "boot camps" to which college graduates selected for officer candidates class are sent.)

While at the recruit depots, each man is interviewed, tested, and classified for the work for which he is best suited. The men selected for engineering duty are sent to an engineer training battalion where they are given training in organizational problems. Selected members of this group are sent to specialist schools conducted either by the Marine Corps, or by some other organization for the Marine Corps on a contract basis.

Fig. 2. Proficiency in establishing a water supply for troops in forward areas is attained by practice drilling of a well and connecting it to canvas storage tank.

Fig. 3. Empty gasoline drums are welded into culvert pipe and used to drain Henderson Field on Guadalcanal.

Fig. 4. Bridges often must be built with a minimum of finished material, so that training in craftsmanship with axe and saw are necessary.

The Marine Corps engineer schools, located at Camp Lejeune and Camp Pendleton, offer thorough courses in the following subjects: Aerial photographic interpretation, bridging, camouflage, demolition, drafting, engineer heavy equipment, field electrical work, machine shop, mapping, photography, photogrammerty, reproduction, refrigeration, surveying, water supply and welding.

Enlisted men who complete satisfactorily any of the major courses are eligible for promotion commensurate with their increased abilities and qualifications. Men who are considered to be officer material are sent to the Officer Candidates Class.

The Marine Corps has been active in the development of new and better engineer equipment. As an example, they developed several years ago, a number of different types of equipment to make potable water from sea water. This equipment has been essential in supplying water on small islands during the dry seasons. Many similar developments have been undertaken and completed, but details must be withheld.

The Marine Corps has maintained constant liaison with the Army Engineer Board, the Naval Research and Development Board, the U. S. Office of Scientific and Research Development, and other governmental and industrial organizations. Every new development is exploited to the maximum extent, consistent with mobility, availability of critical materials, and similar factors.

Engineer assignments

When engineer personnel has been thoroughly trained, the officers and men are assigned to one of three types of organizations: (1) combat engineering; (2) airfield construction; (3) posts and stations.

Each Marine Corps division contains one engineer regiment, one artillery regiment, three infantry regiments, special troops (special weapons, tanks, etc.) and service troops (amphibian tractors, medical, supply services, etc.). Each engineer regiment contains a headquarters and service company, a battalion of Marine Combat Engineers, a Marine Shore Party Battalion, and a Naval Construction (Seabee) Battalion.

The regimental headquarters is equipped with the best mapping and reproduction equipment procurable. Topographic maps are made prior to embarkation, and distributed to all units engaged in the landing operation. In compiling these maps, all possible sources of information are used, including existing maps (if any are available), hydrographic charts, aerial photographs, sketches, and intelligence reports. In addition to the maps themselves, overprints, and over-lays are provided as necessary to accompany plans and orders in the interest of conciseness and clarity.

The regimental headquarters also contains platoons to handle camouflage problems and to pool heavy engineer equipment for assignment to the various companies and battalions as needed.

The Marine Corps shore party battalion is a special organization for facilitating landings. Personnel of this battalion are included in the first

MARINE CORPS ENGINEER OFFICERS

Col. R. M. Montague, civil engineer, in Marine Corps since 1917. Croix de Guerre and three citations World War I. Has served since in Haiti, Nicaragua, China and Philippines.

Col. E. E. Hall, mining engineer, served in France with 13th Marines and since in Haiti, Nicaragua, China and Hawaii. Commended for service in Nicaragua and Hawaii.

Lieut. Col. A. G. Skelton, civil engineer, holder of the Croix de Guerre, the Purple Heart and the Silver Star for action with the 6th Marines in France where he rose to Captain. With Oregon Highway Department and M. C. Reserve until 1940. Since then on active duty in California and Pearl Harbor until ordered to Washington last June to organize the engineer corps of the Marines.

Lieut. Col. H. E. Rosecrans, enlisted in Corps 1917, wounded in France and later in Santo Domingo. Has served in China, the Philippines and Nicaragua.

Lieut. Col. F. C. Meyers, municipal engineer, served in World War I and Dominican Republic, then in Reserve while on municipal work in California.

Lieut. Col. N. K. Brown, graduate U. S. Naval Academy 1931, aerial mapping course and Fort Belvoir School for Army officers. Has served on ship and ashore with engineers.

Lieut. Col. G. E. Tomlinson (author of this article) civil engineer, teacher, recently with Tenn. Valley Auth. on planning, design and construction. Army engineer reserve since 1932.

Maj. T. R. Riley, civil engineer. In corps since graduation in 1935, has served aboard ship and with engineers in field.

Maj. C. D. Clark, consulting engineer, Boston, in M. C. reserve 1933 to 1941.

e of a landing operation. They ch the beach area and maintain a ation map for the information of ceeding landing units; establish oading points and storage dumps the beaches; remove under-water beach obstructions; unload ma- ial from small boats and, when re- ired, construct landing facilities. In addition, they build and main- n beach exit routes; control traffic the beach area, insuring rapid vement of equipment in accord- e with requirements; decontamin- gassed areas; provide local se- rity for the beach area, including handling of prisoners; maintain cords showing organizations, equip- ent, and supplies which have been nded; and serve as combat troops hen needed.

A detachment from the Marine orps engineer battalion is usually nded with each boat group and orks in close coordination with the hore party battalion. The size and mposition of these detachments de- end upon the work contemplated at he beach selected. Upon landing, an rea reconnaissance is made, an esti- nate is prepared of the required en- ineering work and the program of ork is outlined to suit the available naterials and existing conditions.

Normally, personnel of the engi- neer battalion perform the following duties: assist shore party in the re- moval of, and in the unloading and handling of heavy material; repair, construct and maintain facilities for the storage and purification of water; develop water supplies ashore; main- tain water distribution points; con- struct temporary landing fields, in- cluding the repair and maintenance of existing fields damaged in action or in an uncompleted stage at the time of their arrival.

They assist further in the construc- tion of defensive positions, artillery positions, and observation posts; de- molish roads, bridges, and other structures that might be of assistance to the enemy; place mines, sweep and clear mine fields, and dispose of un- exploded bombs; repair, maintain, and operate public utilities; super- vise the work of civilian laborers and prisoners of war, if available, on engi- neer projects; and serve as infantry troops when and as needed.

The Naval construction battalion (*ENR*, Sept. 24, 1942, p. 415) at- tached to the Marine Corps' engineer regiment, reinforces the shore party and engineer battalions during the initial waves of the landing. After the beach head has been secured, the equipment of the Naval construction battalion is brought ashore to do the necessary construction work.

Engineers with other troops

In addition to the engineer regi- ments nearly all other Marine Corps organizations include in their per- sonnel a number of engineers who perform special engineering func- tions, such as surveying, demolition, camouflage, and supervision of re- frigeration, water supply and mis- cellaneous construction. The number of individuals employed on these duties varies from one or two to com- plete platoons, depending on the size and character of the organization to which they are attached.

The Marine Corps also has a num- ber of separate aviation engineer bat- talions whose primary jobs are to map large areas and to construct air fields in territory that has already been secured by our forces.

Most of the Marine Corps reserva- tions accommodate thousands of men and are scattered over many square miles. For example, Camp Pendle- ton, Calif. and Camp Lejeune, N. C. each covers about 200 sq. mi. The maintenance officers at such posts and stations have responsibilities comparable to those of the engineer- ing staffs of cities of large areas and population.

Marines via Selective Service

Men subject to the draft may re- quest service with the Marine Corps Engineers at time of induction or may request voluntary early induction. Draft boards each have a quota to fill for the Marine, from which a lim- ited number go to the engineer troops. It is best for candidates to visit a Marine Recruiting Office to ascertain that they are personally and physi- cally acceptable before asking induc- tion.

Specialists in certain engineering services may apply for commissions to the Division of Reserves, Head- quarters U. S. Marine Corps, Wash- ington, D. C.

For one who wants active fighting along with engineering activity, serv- ice with the Marine Corps engineers is recommended. There will be many challenges to ingenuity and sheer courage under fire, but there will also be a great deal of satisfaction in getting the situation in hand for peace and freedom.

Fig. 5. After a foothold had been secured in the Solomon Islands, prefabricated temporary bridging was installed at stream crossings by Marine engineers.

Access to the World's Largest Building

***Contents in Brief**—Access to the War Department's huge new Pentagon Building in Arlington, Va. requires an extensive highway network to handle the traffic flow caused by the daily movement of 40,000 employees. Providing such roads requires construction of three express arteries together with traffic interchanges and terminal facilities. A total of 24 grade separations and pavement equivalent to about 49 miles of 24-ft. roadway are being built. Inside the building a bus and taxi terminal capable of handling 30,000 passengers in one hour has been provided. Two outside parking fields accommodate 8,000 passenger cars.*

A MAJOR PROBLEM associated with the War Department's huge Pentagon Building in Arlington, Va., was the planning and building of an adequate highway network in that area. The building will accommodate 40,000 office workers and is believed to be the world's largest office structure. (See *ENR*, June 4, 1942, p. 920 and Oct. 22, 1942, p. 569 for details of design and construction). Surveys indicated that no single site of sufficient size was available in the District of Columbia to accommodate the mass transportation and parking facilities for 40,000 employees. Thus, after a careful survey of traffic flow and population in the Washington, D. C. area, a site across the Potomac River in Arlington was chosen.

The existing highway system in Arlington has been inadequate for years and preliminary plans for a new network had been developed by the Public Roads Administration. Since it was evident that the construction of the Pentagon Building would create a transportation emergency, steps immediately were taken to revise the system to meet the added requirements of the new structure and to develop detailed plans for a free-flowing express highway network. Terminal facilities were planned for parking 8,000 cars and for off-street bus, taxi and truck service.

Design of the network was based upon the knowledge that traffic volumes would make it imperative that the system be free from stop-and-go lights, grade intersections, stop signs, left turns and direct access from private property. Efficient use of three Potomac River crossings—the Key, Memorial and 14th St. bridges also was a major factor in the design. It was impossible to forecast accurately traffic to be added at any one of the bridges, as many factors could combine to upset all calculations in a short period of time. However, it was possible to incorporate in the system a high degree of flexibility, thus making full utilization of the bridge capacities available regardless of unforeseen traffic loads.

Consideration was given to the fact that the direction of traffic to and from the Pentagon Building would be opposite to the normal peak loads traveling in and out of the District of Columbia. As a result, traffic volume over the Potomac crossings is expected to increase without a corresponding increase in congestion. To increase further the efficiency of the bridges, improvements are being made to the approaches on the east side of the river. Furthermore, due to the trend toward residential decentralization, it is assumed that more and more War Department employees will reside in Virginia and therefore will not cross the Potomac River in going to work.

Still another factor in the design was to provide for a segregation of the various types of traffic with particular emphasis in maintaining schedules of mass transit vehicles that will carry the bulk of the employees. This design policy meant that in the immediate vicinity of the building the bus and taxi traffic is kept entirely separate from the movement of private cars in and out of the parking fields.

Express arteries constructed

The adopted design, as shown by the accompanying map, the adopted design is very simple in principle. The three major express arteries U. S. Route 1, Army-Navy Boulevard, and Heavy Duty Highway, which connect the Potomac River bridges with the main highway system of Arlington County, are being improved and relocated to form the sides of a 140-acre

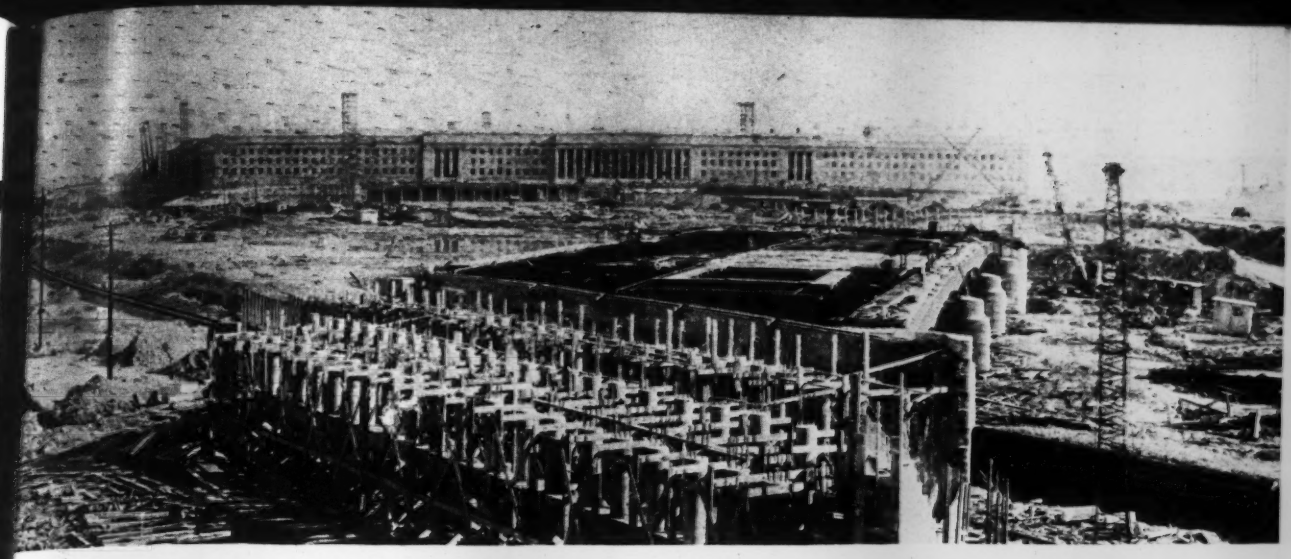


Fig. 1. Approach road leading to main entrance of Pentagon Building, which is shown in the background. The columns in the foreground, which are founded on concrete piles, are to support the roadway back of the abutment.

triangle in which the building is located. These highways are to be connected by modern interchanges, commonly referred to as cloverleafs, and they are designed as free-flowing express arteries. They have three lanes of traffic in each direction, separated by landscaped medial strips and flanked on either side by landscaped slopes. Local access is prohibited except at designated points of entrance and exit.

Bus terminal in building

Off-street loading facilities for buses, taxis, trucks, mail and other service requirements all are incorporated in the design of the building. Vehicles using these facilities operate from a common area on one side of the structure; the facilities are connected by means of a simple T grade separation with one of the three express arteries. At the building, all buses and taxis, regardless of their origin, receive and unload the passengers in a terminal inside the building on the ground floor. The terminal consists of three 20-ft. wide roadways extending the full length of one side; these roadways are separated by 10-ft. wide loading platforms.

Loading platforms accommodate 42 normal-sized or 28 of the large three-axle, super-twin type buses and 35 taxis. Vehicles enter the terminal from the same direction, which permits most efficient assignment of the terminal space in accordance with the demand. A bus and taxi classification pool is located outside the building and parallel to the terminal. This area provides space for 40 buses and an equal number of taxis. Movement of all vehicles into the building is controlled by an electrical dispatch system operated by platform inspectors within the terminal.

There is sufficient flexibility in the terminal design to provide for an interchange of bus and taxi facilities should this be found desirable; for example, the two-lane width of the roadways will enable vehicles to bypass buses that are being loaded or unloaded. There are 21 stairways leading from the three platforms to a 120x680-ft. concourse directly above

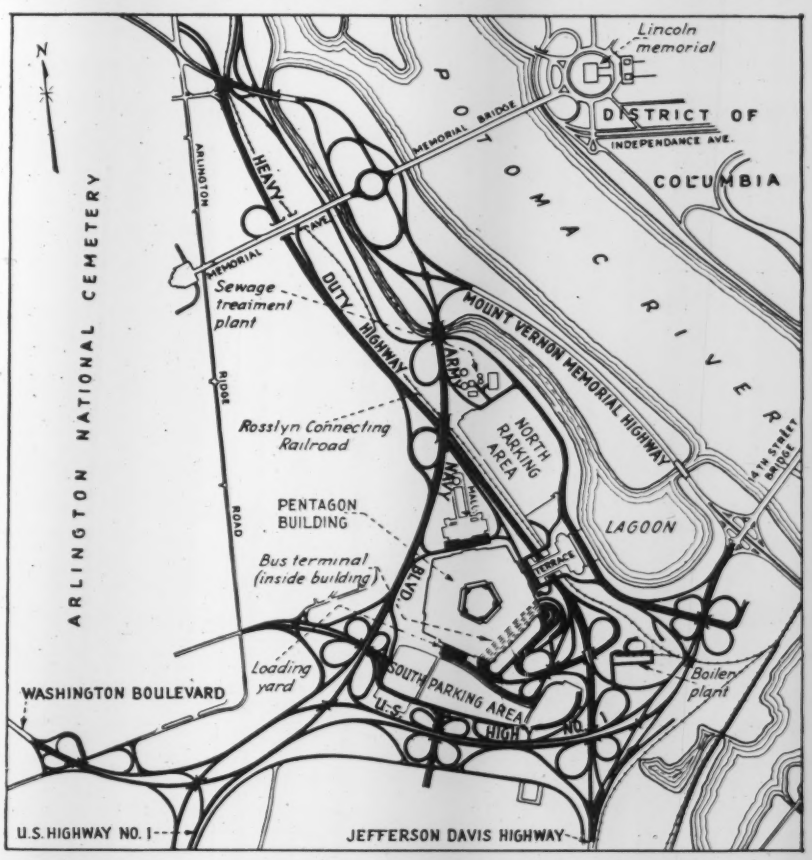


Fig. 2. New highway construction for Pentagon Building is shown as black on map above; existing roads tied into new network are shown as white lines. Not shown is Key Bridge, which is some distance upstream from Memorial Bridge and thus off the map at the top.

the terminal, where subway type coin turnstiles are utilized. Use of these turnstiles eliminates fare collection by the bus operators. In a one-hour period it is possible with this arrangement to load or unload all of the 30,000 or more employees expected to patronize the mass carriers. Distribution from the concourse is by means of ramps leading to the various floors. (For details of circulation of workers within the building see *ENR*, Oct. 22, 1942, p. 569).

Two big parking fields

In planning the parking fields for cars to be used by the employees of the building, studies to determine the ratio of cars to employees indicated that two large parking areas on opposite sides of the office would be needed. Design of the interchanges between the fields and the express arteries received careful attention, with particular emphasis placed upon flexibility of control. If congestion results on any of the three Potomac River bridges previously mentioned, the trouble can be relieved by controlling the vehicles using the parking fields. For example, all cars using the north parking field and traveling to Washington can be directed to use any one bridge, thus relieving the two other crossings.

Also by this arrangement traffic bound toward the District of Columbia may be directed over the Key Bridge and thus detoured around the congested public office area in the vicinity of Constitution Ave. Both parking fields, however, have suitable connections with all three crossings, as well as with the Arlington highways.

Each parking area is designed to accommodate about 4,000 cars and

Fig. 3. To conserve critical materials, the 75 directional signs were made of 1-in. plywood. They are made in the form of a pentagon.

covers roughly 27 acres. Both fields are divided in sections that are laid out at right angles to the building, and each section is a 59-ft. wide strip of pavement flanked by 3-ft. gutters (Fig. 5). The concrete slab, which is 6 in. thick and slopes toward the gutter, was poured in four separate lanes 14 ft. 9 in. wide. Two rows of cars park in each section with an 8-ft. width provided for each car. Cars parking in these sections head in toward the gutters, which form a guide in controlling the parking operations, although they do not prevent crossing the field in a diagonal manner.

Operation of the parking fields provides that vehicles enter from distributing roadways on the side of the fields farthest from the building, and that they park in a continuous line starting at the building side of the field. This plan allows pedestrians to walk from their cars to the building without meeting or being passed by a heavy stream of cars. The sidewalks that lead from the parking field enter the building at locations where the employees can travel to the main corridors by means of ramps.

Provision has been made for the planting of one tree for every nine or ten cars in the parking areas. These trees are to be placed in curbed tree wells and spaced in an irregular pattern throughout the field. Their presence will serve to break up the vast expanse of the fields and will help in the general landscaped treatment of the area.

Extensive grading required

Grading for the complete highway network, the parking fields, and the Pentagon Building is in itself a major project, since the total volume of earth moved is about 7,000,000 cu. yd. One factor influencing the fill required is the low elevation of a portion of the area; the old Hoover Airport, which is a major part of the site, was below flood level and required extensive fill to place the roads and other facilities in that area above maximum possible floods. In addition, the many grade separations require that some of these roadways be constructed entirely on an embankment.

Use of such a large site called for an extensive drainage system. This provides for the bulk of the run-off to be collected and carried into a la-

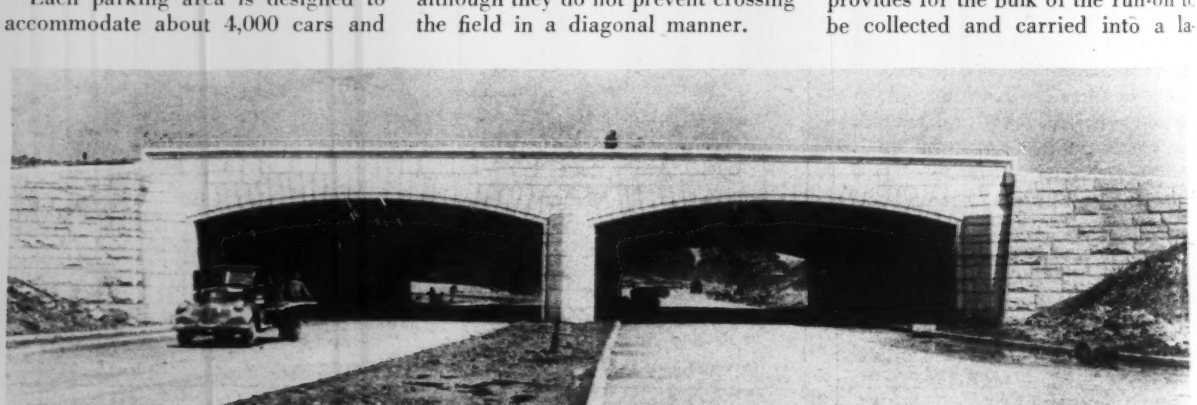


Fig. 4. This reinforced-concrete, rigid-frame structure, which was built to carry Memorial Ave. over Heavy Duty Highway, is typical of the many new bridges.

Fig. 5. South Parking Field, which will accommodate 4,000 cars. Black areas spotted at random over field are tree plots.

goon along the Potomac River by two 84-in. dia. storm sewers. The drainage design is also complicated by the many sub-surface structures in the area; conflicts in the location of the storm and sanitary sewers, gas and water mains, electric and telephone ducts, as well as steam and utility tunnels, was avoided only by careful design and installation.

Over 40 miles of pipe-lines and ducts will have been installed within the building area prior to completion of the pavement. Thus, the completed roadway pavements and landscaped areas will give little indication of the volume of construction hidden below ground.

Traffic is divided

The roadway on the main highways consists of two 36-ft. wide pavements separated by a variable width, landscaped mall; each 36-ft. roadway is divided into 12-ft. lanes. Route 1, in addition to the six lanes, which are a uniform 10-in., reinforced-concrete slab, also provides acceleration and deceleration lanes. These special lanes, as well as the access connections, have a bituminous top, contrasting with the concrete pavement used on the main highways. This pavement color and texture contrast aids the driver in distinguishing between the main route and access connections and is in accord with good practice on urban parkway work.

In the case of the Army-Navy Boulevard and Heavy Duty Highway, the inner lanes are a 9-in. reinforced-concrete slab, but the outer lanes are considered to be continuous acceleration and deceleration lanes. They are constructed of an 8-in. concrete base and a 1½-in. bituminous top, which will blend into a similar type access road pavement.

Access drives are designed in so far as practicable to provide for a gradual change of direction and speed. All curves are either spiralled or compounded with emphasis being given to the proper super-elevation and widening of the pavements where necessary.

To the pavement for the two inner or express lanes of all of the highways an admixture of emulsified carbon black is added. This addition eliminates the glare caused by the sun's reflection on light concrete surfaces.

In general, the curbs on the main highways are 3-in. high along the center mall and 6-in. along the outside and on the access connections. The shoulders are of 11-ft. minimum width and the slopes are varied to meet local conditions.

Twenty-four bridges required

In all, 24 bridges are required; 21 were designed and are being built by the Public Roads Administration and three by the War Department. Most of the crossings are reinforced-concrete, rigid-frame structures faced with stone masonry. In general they are moderate in span and width and have a varying angle of skew. A typical bridge is one carrying a three-lane, divided highway over a similar road by means of a two-span design. Reinforced concrete was used everywhere possible to save steel, but steel

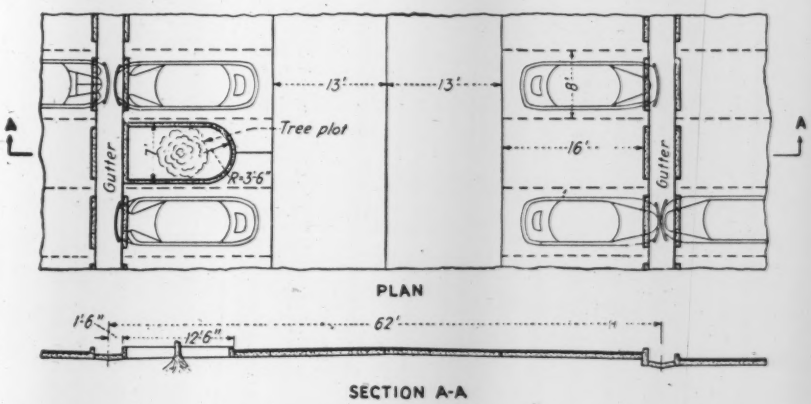


Fig. 6. Detail of pavement for South Parking Field shown in Fig. 5; North Parking Field pavement is very similar. Use of completed portions of the fields has proven this layout very satisfactory.

girders are used on three structures because of the large skew angles and the long spans involved.

The most interesting crossing is the three-level grade-separation structure at the junction of U. S. 1, Army-Navy Blvd., Washington Blvd., and the proposed Henry G. Shirley Memorial Highway. Use of this type of structure permits a direct routing of the traffic in all directions and eliminates the short radius loop so often inherent in the typical traffic interchange.

Pursuant to urban parkway practice and to the policy of using materials of a non-critical nature, the guide railings are of timber. The single-rail, low type is more common; the double-rail, high type is used only where necessary because of steep slopes. Rails are set out from the face of the posts to present a continuous smooth surface designed to deflect colliding vehicles.

Directional signs and lighting

The directional signs constructed by the War Department, which will total 75, are distinctive in shape, having the form of a pentagon. The signs vary in width from 24 to 48 in. and they are 1-in. plywood with the lettering in accordance with the recommendations of the American Association of the State Highway Officials. As the Pentagon Building will not often be visited at night by persons unfamiliar with the area, the signs directing traffic to the building are free of reflecting material or artificial lighting in order not to compete with the main highway signs during hours of lowered visibility.

Most of the highway lighting must be postponed for the duration because of the lack of necessary materials. However, conduits are being placed under the pavements at this time to avoid costly later installation. In areas where pedestrians now move at night, such as in the parking fields, lighting is to be provided at the present time.

Who's who on the job

Design and construction of the highway network is a cooperative venture resulting from an agreement reached between Lt. Gen. Brehon Somervell of the U. S. Army and Commissioner Thomas H. MacDonald of the Public Roads Administration. In general the main highway system and interchanges were designed by the Public Roads Administration and constructed under its supervision. The roads to the building, the parking areas, and the highway facilities inside and adjacent to the building were designed and constructed by War Department. Considerable liaison between both organizations was necessary. Much of the grading of the main highways adjacent to the building under PRA supervision was done by the War Department through its general contractors.

For the Army, Lt. Col. Clarence Renshaw, as district engineer, is in charge of the entire Pentagon project, for which George E. Bergstrom and David Witmer were architects. Highway design for the War Department is under the direction of Maj. W. S. Chapin, transportation officer originally engaged for the work as an engineering consultant. Highway design for the Public Roads Administration was in charge of Joseph Barnett, under supervision of the late R. E. Toms, chief of the division of design, and construction is under the supervision of Harold J. Spelman, district engineer. Various contracts were let by the Public Roads Administration, but all work for the War Department is by John McShain, Inc., Doyle & Russell, and Wise Contracting Co., Inc., the general contractors on the highway work.

Municipal Services at Lower Cost Through Cooperative Arrangements

More than a score of small Pennsylvania communities are performing through "joint authorities" government functions they could not afford to finance individually, the American Municipal Association reports in a recent bulletin.

By joining forces, with state legislative approval given in 1935, four groups of towns and villages have built new, or have improved existing sewer facilities, and may construct and operate bridges, tunnels, streets, airports, sewers and parks as a joint enterprise.

Construction and operation costs of the projects and administrative costs of the authorities are allocated among participating communities in proportion to size of areas served, benefits to populations of areas served, and so forth.

Seed of the idea for cooperative action through joint authorities was an informal cooperative arrangement worked out a number of years ago at meetings on the common problem of sewage disposal by representatives of communities in the Darby Creek and central Delaware River areas.

The state legislature in 1935 gave such groups authority to organize joint sewer boards as advisory and administrative agencies in construction and operation of sewer improvements. Activities were limited, however, since the sewer boards could not make improvements or spend public funds without approval of voters of all the cooperating municipalities making up a joint authority.

Eventually it became necessary to build a pumping station and sewer main to carry sewage from one area to the Delaware River some distance away, and an independent means of financing the project was needed. This was provided by a 1937 state law authorizing formation of joint authorities as corporations, with each participating community having one representative on the authority board.

The board was given power to build and operate projects and charge cities for use of facilities or services, borrow money and issue bonds, make contracts and exercise the power of eminent domain.

This formal cooperation, in contrast to informal arrangements, allows greater flexibility of operation, centers legal responsibility on the enterprise itself, and permits an independent method of financing which may be beyond reach of a single community.

Two of the four groups of communities operating joint authorities are in Delaware County. Making up the Darby Creek Joint Authority are Aldan, Clifton Heights, Collingdale, Colwyn, Darby, Lansdowne, Sharon Hill and Yeadon, and the townships of Springfield and Upper Darby. Eight other communities make up the Central Delaware County Authority.

rtar-Coated Piles Resist Hard Treatment

***ts in Brief** — Recent addi- xperience with some 2,500 un- wood piles coated with shot- by methods developed by S. Engineer Department early 2) demonstrates that the have great resistance to handling and give the piles and durability. On a job several other types of piles sed, strength and rigidity of rtar-coated piles showed them uperior.*

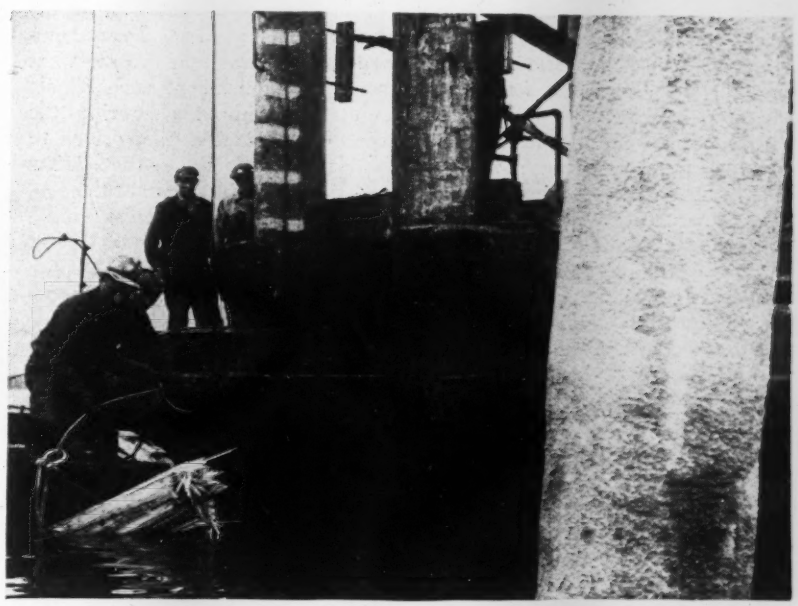


Fig. 1. Close-up of mortar coating on a pile that was struck 5,052 times with 15,000-ft.-lb. blows delivered at the rate of 120 per minute.

ER APPLICATION of shotcrete ion for wood piles, developed ast year by the United States er Department, has just been t a west coast port with very ctory results. The development idea and the method of apply- e protective coating on what garded as a pioneer job were bed in *Engineering News-d*, Nov. 5, 1942, p. 624.

h only minor changes in ds or equipment the same kind tection has since been used on h larger job, described in the ing, which confirms the earlier sion as to the advantages of ethod. In fact, results have been iformly successful that when- minor failures were found in the g operations they could always ced to mechanical defects—the y of the design and the method plying materials are accepted as ct and the adequacy of this type le protection is considered to been well demonstrated.

e new job is a large wharf re- built for military purposes in 14,000 piles were used, of with fill protection and not of length. Some parts of the struc- however, required piles more 100 ft. long where severe expo- conditions have to be met. For latter service some 2,500 un- ed wood piles with sand-cement ts were used, as well as some oted piles, a considerable num- of precast concrete piles and a few untreated piles protected by precast jackets.

The urgency of the demand for speed made it necessary to use whatever materials were readily at hand. The result is a structure affording opportunity to study relative merits of various kinds of piles. As construction progressed, the untreated wood piles that had been given a sand-cement coating were found to be so sturdy that it soon became the custom to save them, in preference to other kinds of piles, for those spots where the driving was the most difficult. They withstood driving with the heaviest hammers better than did creosoted piles or piles driven butt down for later protection with a precast concrete jacket. Reports of the U. S. Engineer Department officers in charge credit the shotcreted piles with results in every respect surpassing what was expected of them.

When the driving started a few piles showed a tendency for the mortar coating near the top to break away and slide up the pile. This was completely corrected by increasing the lap of the wire mesh to about 6 in. and putting 4-in. square shear pockets at 18-in. centers instead of the 24 in. previously used.

Only other weakness developed was that due to rebound or the pocketing of rebound between the mesh and the pile. This trouble was entirely eliminated by insistence upon careful manufacturing methods.

The 2,500 piles with the mortar coating range from 100 to 127 ft. in length. A high percentage measured well up toward the maximum length because, as mentioned, these piles were selected for locations where the most severe conditions obtain. Average pile length was 108 ft. The jacket lengths ranged from 15 to 48 ft. and an endeavor was made to have jacket- and pile lengths such that the jacket would go down a few feet into the mud to insure protection against borers.

Coating of the untreated piles was applied in the same manner as for the job previously described. In fact, the application was made on the same skids in the same location. Instead of using buoyancy units to float the piles to the driver, because the new job required a water trip of some 30 miles, a barge was used for transportation and the mortar-jacketed piles were loaded on the barge, usually about 40 per barge load, for towing to the job.

Piles coated in this way do not re-

quire any special care in handling. In lengths up to 100 ft. a single line was used for lifting them from the barge to place in the driver leads. For piles more than 100 ft. long a two-point pickup was used, one line being attached near the head and the other at about one-third of the length from the butt. Because of the great urgency for speed, and because it was soon found that these mortar-coated piles did not break down under heavy battering, the hammer used was modified so that heavier blows could be struck.

In the revised form the anvil of the hammer had a width of 28 in. (the full spacing of the leads) and the entire area of the pile butt, even if 18 or 20 in. in diameter, could be brought into contact with the face of the hammer, thus avoiding concentration on a smaller area that would tend to broom the wood even with a hardwood cushion block. This hammer, with which most of the driving was done, struck 15,000-ft.-pd. blows at the rate of 120 per min. and more than doubled the speed of driving as compared to the previous rate. This represents a notable speed-up, as the hammer used at the outset was the heaviest type commonly used on this type of work.

After some experience with the resistance of these piles to heavy hammering, a test was made to see what amount of punishment such a pile would take without shattering the jacket. In this test a pile, driven to practical refusal, was struck 5,052 blows (15,000 footpounds at the rate of 120 per min.) without developing the least indication of cracking or breaking the coating except at the top in the 2-ft. length closest to the hammer.

Where a pile could not be driven down for its full length and, as a result, it became necessary to cut off the top, a pneumatic chipping hammer was required to break away the sand-cement coating. After caps and deck structure had been put on, crews worked beneath the deck with matic equipment, applying an tional mortar coating to porti piles that had been left expos hence required protection. A deck structure was entirely o crete, this final shotcrete trea sealed off all exposed wood su The same protective coating trea was applied to that portion of th structure for which creosoted had been used, and hence the substructure has fire protection.

One of the outstanding featu this type of pile is that the jack creases the diameter and also s the original wood to such an that great rigidity is obtained consequent benefit to the super ture. A striking demonstrati rigidity was afforded where the of tidal currents could be observ a cluster containing both cre and mortar-coated piles. Those jackets stood rigid and immo while the slimmer and more fl piles were kept in continual m by water currents which ca weaving and swaying in sharp trast with the adjacent jacketed p

As a whole, this job offered usual opportunity for comparing and relative merit of several typ piles. Data of a comparative na taken from official records are s marized as follows:

On a price basis, scaled from percent for the most expensive t and taking a length of 105 ft. in to be able to include a represent number of all types, the relative of four kinds of piles rate thus:

Precast concrete, 20 in. square. 10
Precast concrete jackets, un-
treated wood 7
Mortar coating, untreated wood 8
Creosoted wood 9

These percentages are based on tual prices paid to the contractor piling in place on this job.

It should not be assumed t these piles of different types h equal bearing capacity. The creos piles, with a diameter 3 in. less th those with mortar coating, have carrying capacity rated as not m than one-half that of the mort coated piles. If creosoted piles o in. larger diameter had been used was estimated that $50 to $75 pile would have been added to t cost and their strength would still materially less than that of the m tar-coated piles.

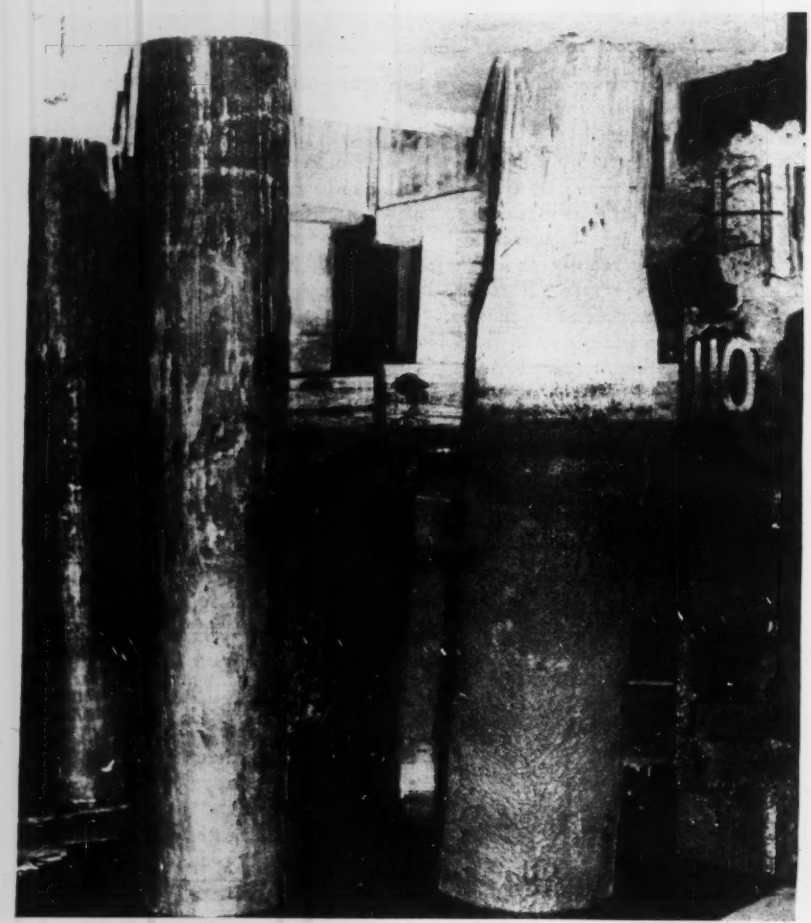
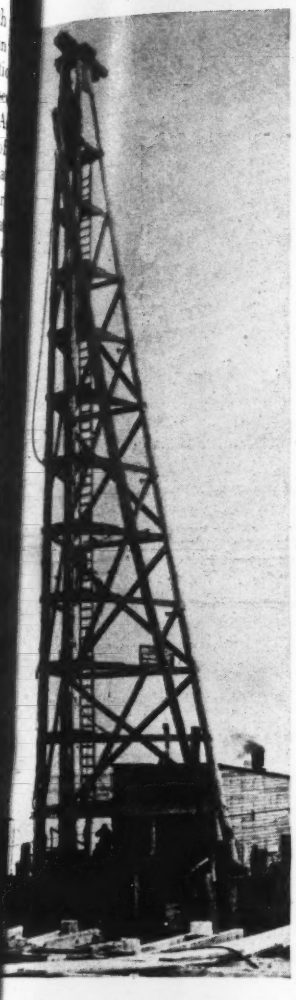


Fig. 2. Mortar-coated piles are thicker and sturdier than those treated with creosote. All exposed wood has to be coated with mortar for fire protection.



A single line lifts a long, mortar- pile to the driver leads.

ivalent penetration could not tained with creosoted piling be- the heads could not withstand vere battering that the green piles would take when pro- with mortar. As a result the ted piles were not used where heaviest driving was required. driven side by side, a penetra- f 25 to 40 ft. greater was ob- with piles of 9-in. tip diam- rotected with mortar than could tained with creosoted piling of ame tip diameter. Wood piles cted with precast concrete jack- d not give maximum penetration se these piles were necessarily n upside down to permit of ap- g the precast jackets, thus mak- it necessary to do the driving on mall end which was more likely oom under heavy driving. With forced concrete piles maximum penetration was not obtained even with the largest steam hammers.

Hence it was only with the mortar-coated piles that the necessary penetration could be secured. With them a 90-day saving was made that otherwise would not have been possible. The actual cost saving was on the order of half a million dollars.

The general contract on this job was held by Ben C. Gerwick, Inc., and was carried out under supervision of the Corps of Engineers, U. S. Army.

Six Methods for Increasing Yield from Water Supply Wells

Experiences in the use of methods for increasing the yield of water supply wells are given in the following abstract of notes in *Over the Spillway*, a bulletin of the Illinois State Department of Public Health.

(A) Dry ice has been used for more than 20 years. "Shooting" has worked in wells more than 1,000 ft. deep. At Lawrenceville, Ill., the following procedure gave good results: (1) drop-pipes and foot valves were removed and cleaned mechanically, (2) incrustation was removed by pumping, (3) muriatic acid was poured into the wells and circulated by a ditch pump for nearly a day, (4) acid was pumped out and water neutralized with soda ash. Sufficient 25-percent solution of inhibited muriatic acid was used to make a 6 to 7 percent acid solution in the wells.—W. J. Schneider, Illinois Municipal Water Service Co.

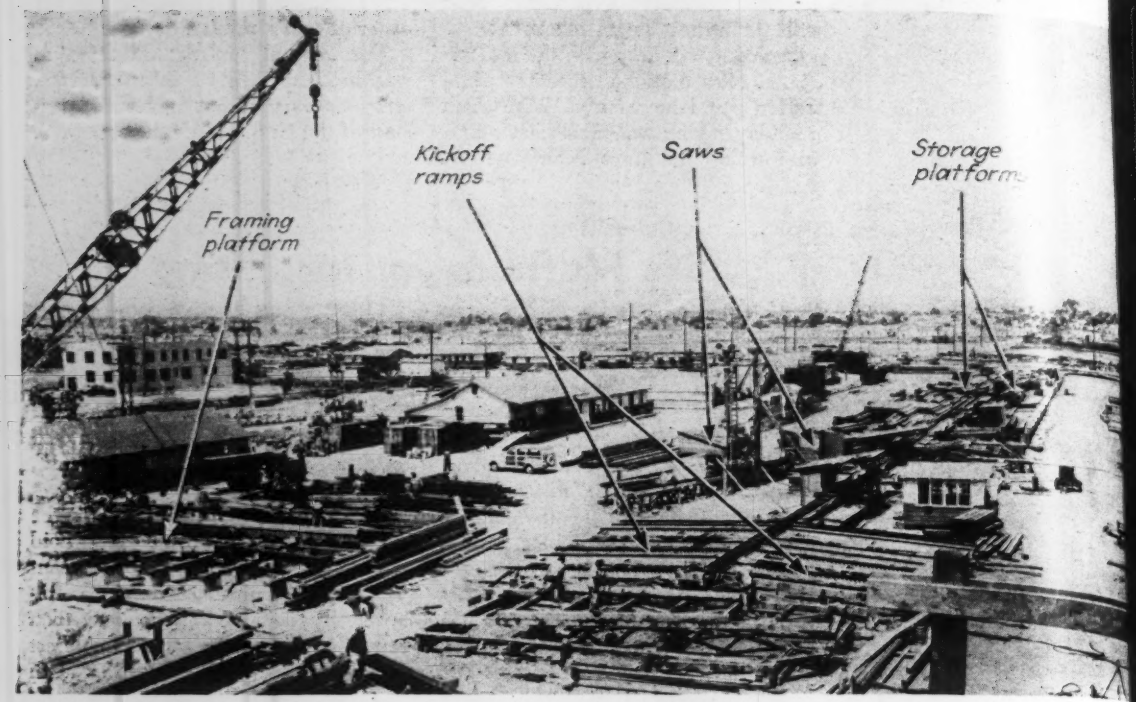
(B) Muriatic acid will not clean out iron deposits on the well casings. Lactic acid, as used in oil wells, would probably work. In acid treatment, galvanized pipe should not be used, on account of the zinc in the coating. In a case where calcium carbonate plugged a well, muriatic acid was applied through a black iron pipe, the well top being then closed tightly in order to obtain full effect of the gas pressure released from the acid. After two hours, the water in the well was surged for eight hours. If iron is dissolved and precipitated in cleaning the well, it may cause recementing of the sand grains and clog the well, but 3 percent of acetic or citric acid added to the muriatic acid will eliminate much trouble if there is iron in the water. Muriatic acid has been used to dissolve sand and shale in oil wells. Calcium sulphate in wells can be dissolved by use of ammonium salts. Lactic acid has been successful in cleaning sand formations, as it is not spent so quickly as muriatic acid.—R. Seniff, chemist, Alton Railroad.

(C) To increase the flow of the campus wells, chlorine and acid treatment has been used in recent years. Mechanical cleaning is followed by acid treatment, and then sometimes chlorine treatment. Best improvement was by treating with chlorine before applying the acid. Iron and carbonates were principal causes of reduced yield by plugging. —H. White, sanitary engineer, University of Illinois.

(D) After injection of muriatic acid within a pump, the wells were sealed for 24 hours. Then they were pumped for 5 hr., left idle for 4 hr. and again pumped for 6 hr. Litmus paper was used to determine when the pH of the well water was high enough to permit use of the water.—J. Shimp, superintendent of water works, Naperville, Ill.

(E) After studying underground formations, 250 quarts of nitroglycerine, spaced at intervals, were used in shooting a well. During a subsequent 65-hr. test, 75 cu.yd. of sand was bailed out. The yield was so increased that the entire cost, $7,000, will be retired in a few years.—C. Duy, engineer, Aurora, Ill.

(F) Many wells are clogged prematurely by pumping at excessive rates. In present practice, larger screen openings are provided. In many cases it has been found desirable to pump sand through the screens into the wells, rather than to use small screens and risk plugging the wells. Many wells in glacial-drift are packed with gravel outside the screens. Operators of groundwater supplies should keep weekly records of water levels.—J. J. Woltman, consulting engineer, Bloomington, Ill.



1. Conveyorized timber fabricating yard as seen from the assembly area.

Moving Timbers in a Fabricating Yard

***Contents in Brief**—Timber truss frames weighing 14 tons each, which had to be fabricated for a special naval purpose, required unusually large and heavy timber members. To move these timbers to the saws, to the framing platforms and to the assembly areas, a combination of truck cranes, roller conveyors, skids and guy derricks was successfully used.*

AN EFFICIENT yard layout for cutting, framing and assembling heavy timbers into special structures has been devised by a contractor at one of the Navy's shore establishments. The job requires the fabrication of a large number of duplicate trusses or frames, weighing 14 tons each; and the necessary moving of both heavy and light timbers through the yard from storage to the saws, then to framing platforms, and finally to assembly areas presented the basic problem. It was solved by an interesting combination of roller conveyors and skid platforms, supplemented by a truck crane and two guy derricks.

Timber comes to the yard by rail and is unloaded by the truck crane direct to a raised storage platform, or, if the platform is full, into piles alongside the track. The storage platform slopes on a 1:10 grade from both edges toward the centerline, along which a roller conveyor is installed. Workmen skid the timbers onto the rollers, and the fabricating work is under way.

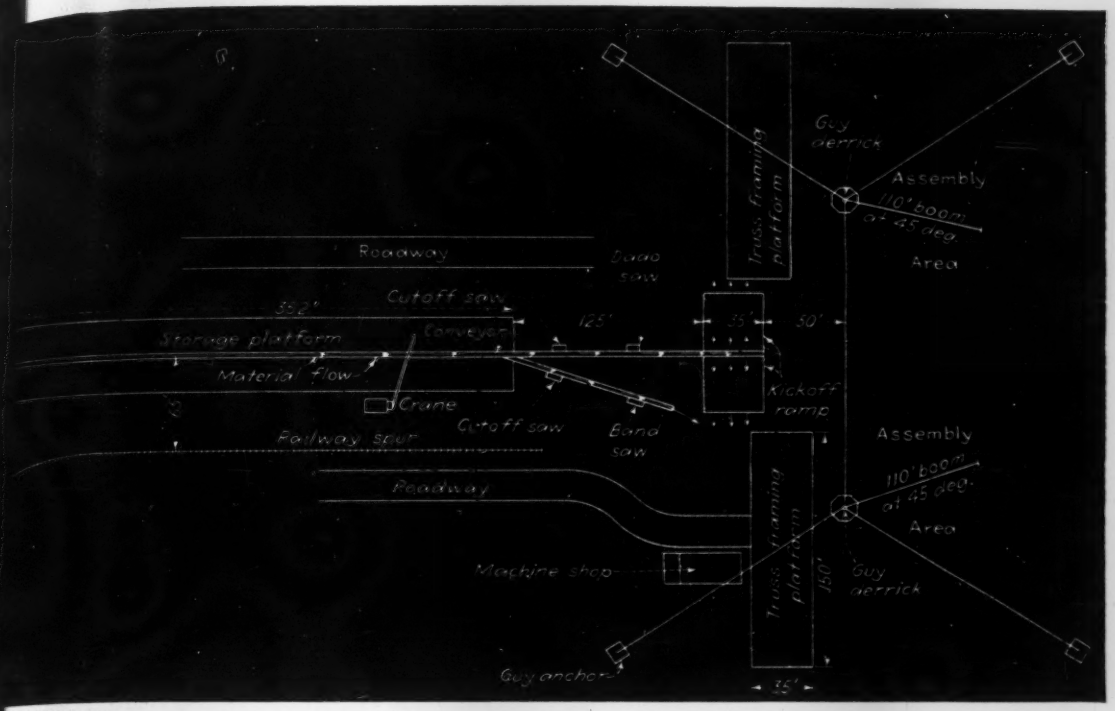
As shown in the accompanying sketch, the yard is composed of four main areas, which are devoted to storage, sawmill, framing platforms and assembly areas, respectively. Duplicate framing and assembly facilities permit two structures to be worked on simultaneously.

Details of the conveyor lines

The roller conveyor, which extends the length of the storage platform, carries on through the sawmill to a kick-off ramp that serves the two framing platforms. In addition to this "main-line" conveyor, on which located two saws for the hea timbers, one a cutoff with blade to 36-in. in diameter and the equipped with a dado attachm there is a branch conveyor which the smaller pieces move cutoff saw, or to a band saw special treatment.

In all, about 640 ft. of roller veyor is used. Two sets of rollers, above the other, with the roller each set spaced 24 in. apart and t in the top and bottom sets stagge in relation to one another, make the conveyor, which is friction-a ated by a 12-in. wide endless threaded between the two sets of ers. The rollers themselves are 1.9 in diameter and 24 in. long, and mounted in ball bearings in a 3x -in. angle iron frame.

The timbers ride on the top se rollers, while the lower set me serves to hold the belt in contact w the top rollers. Were the belt to a ate all of the top rollers, the speed the conveyor would be excessive. the mounting of the lower roller



...out for handling heavy timbers by roller conveyors from storage through saws to framing and assembly.

...to be adjustable vertically. By ...g any desired number of these ...downward until the belt loses ...t with the top rollers, the speed ...conveyor can be varied while ...aining a constant belt speed.

...er passing through the sawmill, ...mbers are carried forward to a ...ff ramp sloping downward on ... side of the conveyor, and ...ed on each side with 7 lines of ..., the rollers in each line being ...m. diameter and spaced on 6 in. ...rs.

...ed timbers are pushed off the ...yor by deflector plates and slide ...the ground adjacent to the fram... ...latforms. The truss outlines and ...hole locations are marked on the ...ng platforms so that it is only ...sary to lift the timbers into their ...r places with the guy derricks ...begin the truss assembly. All ... are bored on the framing plat... ...s.

...soon as a truss frame is finished ...picked up by one of two 15-ton ...derricks and transferred directly ...e assembly area. It will be noted ... the accompanying drawing that ...e simple expedient of joining the ...of the masts of the two derricks ...her with a horizontal tie, two ...ned guys to the ground are elim... ...d. This guy wire arrangement ...its the derrick booms free movement throughout 240-deg. arcs.

The work is being done by the Pacific Bridge Co. under the direction of Capt. H. W. Johnson (CEC) USN, who is public works officer of the shore establishment.

Surplus Materials Placed in Pool To Alleviate Critical Shortages

Because a great volume of construction work is being handled in a very short time in the South Atlantic Division of the Army's Corps of Engineers, serious shortages and occasional surpluses of specific materials occur. To alleviate the shortage and make best use of the surplus, a material pool has been instituted that rapidly moves idle items to point of need.

Whenever material on a particular job is found to be surplus, the fact is reported in duplicate, on special forms, to the district offices of the engineer corps. If some job in the immediate district will not use the material in 10 days, one of the report forms is forwarded to the division office to be made available to other districts.

With material as short as it now is, the division office receives requests for assistance in locating many items not listed as available. A master file on a wheel index quickly gives the materials man in the division office information on quantity and location of surpluses. Generally the entire question of availability is handled by one telephone call and the needed items started on their way.

What is known as a "conference teletype" of shipping instructions is sent out, with copies, to the points of origin and destination of the materials and to each office interested.

The personnel of the pool are also the division expediters for delivery of materials, and consequently know what is on hand at various jobs and when it will be actually used on the work. This knowledge is occasionally drawn on to advise a job that material they urgently need is on hand nearby and can be "borrowed" for a week or two until replacement shipments are received. In this case the borrowing job pays all handling charges of the exchange.

Test Runway Gives Data on Base Thickness Requirements

***Contents in Brief**—The thickness of base needed under a 3-in. asphaltic pavement subjected to typical airport runway service, including the vibration and impact of planes warming up and landing, was the subject of investigations at a California airfield where gravel base thicknesses up to 45 in. were tested to destruction. Conclusions give thickness needed for wheel loads up to 54,000 lb.*

UNDER THE DIRECTION of the Corps of Engineers, a test section of airplane runway was built at a California airfield and tests were carried on over a four-month period in the early part of 1942. This test section was a part of a comprehensive program of tests to check the design for flexible pavements which had been extrapolated from California experience by the Office of the Chief of Engineers. The test program included measurement of deflection in a specially built pavement under static and moving wheel loads with and without airplane motor vibration. The flexible pavement built for the test varied from 6 in. to 4 ft. in combined thickness of pavement and base; wheel loads used ranged up to 54,000 lb. on a single rubber-tired wheel. Static load tests were made with rigid bearing plates whose areas were comparable to airplane tire-prints.

The California airfield was selected for the tests because (1) the soil has the low bearing values typical of numerous other sites where airport construction is contemplated and (2) the subsoil was uniformly wet at the time—a prerequisite to a real test. To a depth of 3 ft. the subsoil consists of black adobe of A-7 classification and at the time of the test had a moisture content of about 30 percent. Undisturbed samples of the materials showed a bearing ratio 3 to 8 percent (average about 5 percent). Subsoil below the black adobe was a grey clay, also of A-7 classification, with about the same moisture content.

The base material, similar to what can be expected in many areas of the western states, showed a minimum California bearing ratio of 69 percent at a penetration of 0.5 in. after soaking. This material was thoroughly compacted with a 12-ton roller at optimum moisture content in 4- to 5-in. layers to a relative compaction of 97 to 100 percent of maximum density.

Over this base a 3-in. asphaltic concrete pavement was laid, using a paving mixture containing about 5 percent of material passing 200-mesh sieve and 5.4 percent (by weight) of 70-penetration asphalt. In this combination the objective was to obtain as flexible a pavement as possible without inducing instability.

As to the performance of the pavement itself, under traffic, where the thickness of base was inadequate, grooving of 1 to 1½ in. developed before serious cracking and initial failure occurred. Early in the test, fine hair cracks could be seen on cold days ahead of the points where initial failure appeared. Although the mixture was very stable, it was sufficiently plastic and flexible to permit the sealing up of fine cracks under traffic on warm days.

Static and moving loads

Static load-bearing tests were made with circular bearing plates of sizes varied to correspond with tireprint areas of the wheel loads used in deflection and traffic tests. These tests were made with the loading frame and hydraulic jack assembly shown in Fig. 1. Load was applied in increments of 5 lb. per sq.in. except for the heavier loadings, on which increments were 10 lb. per sq.in. Each increment was maintained for 2 to 5 min. or until practically all deflection ceased. Maximum loads were 50 tons.

As soon as the pavement was completed, electric gages were inst
at locations selected to cover
range between 12- and 48-in. t
nesses of pavement and base. P
of measurement were 3 ft. inside
edge of the pavement. Deflec
were measured first at the p
where the base thickness was
and then progressively toward
thickest base. In these tests the li
loads were made with dump tr
and the heavier loads with carr
scrapers and with a bombing p
loaned by the Air Corps for the
pose. The measuring of pave
movement was made with the elec
gage equipment ordinarily used
the California Division of Highw

Tests with a plane

Test procedure with the plane
to first tow the plane over the def
tion point with the motor dead. T
the plane was stopped with one o
wheels centered over the gage; a
movement ceased, measurements w
made for the static wheel load w
the motor dead. The motor was t
operated at 1,100 r.p.m. (warmi
up speed) for 3 to 5 min. until
gage indicated that equilibrium h
been reached, after which the mo
ment was recorded on the oscil
graph. The motor speed was then
creased to 2,250 r.p.m. (take-
speed) and another oscillograph r
ord was made. Tests were also ma
with the plane taxiing over the
struments.

The tests indicate that the dynam
effect of motor vibration may great
increase the deflection when the pa
ment and base are either inadequa
or just sufficient to support the r
ing wheel-load. Oscillating mo
ments in the pavement which did n
greatly exceed one thousandth of a
inch, as indicated on the oscillogra
films, caused additional progressi
deflections of considerably great
amounts. It was assumed that wh
pavement and foundation are suf
ciently weak to permit some plast
deformation under a rolling whee
load, the amount of movement fro

oad repetition increases with
oration. On the other hand,
plane is taxiing at a consider-
peed, the wheel-load, plus vi-
, will not remain at one place
fficient length of time to cause
reciable amount of plastic de-
ion and, under these condi-
he deflection may be less than
same load under static con-

act tests were made with 5,000-
heel-loads by dropping the
off $\frac{7}{8}$-in. and 2-in. boards
across both wheel tracks and
ed with smooth approaches.
istance between the edge of the
and the point under test was
lly increased until the tire
the pavement directly over and
lightly ahead of the deflection
These impacts did not increase
flection for the 15-m.p.h. speeds
n the tests. The report suggests
stiffer tires or higher air pres-
had been used the impacts
have increased the deflection
derably where thickness of the
ent and base were insufficient
ry moving wheel-loads for a
number of repetitions.

bomber plane that gave static
-loads of 25,000 lb. was avail-
or only a few hours and deflec-
ests were made only at the bot-
f the base at two points, namely,
nd 32-in. thicknesses. These
selected because from other data
s expected that adequate design
be near one of these two thick-
s. Vibration of the motors in-
ed the deflection slightly over the
s for the static load with the
dead. Although these results
5 percent higher than the deflec-
measured under the rolling
-load, it is believed that if the
had been made on a lesser thick-
of pavement the influence of the
mic load would have been much
er. The films indicate that the
lating movement at the bottom
e base did not exceed one thou-
h of an inch.

observing the distribution of
tion of the pavement under mov-
wheel-load it is notable that
imum deflection occurred a few
s back of the center of the wheel.
ough the high deflection values
within "an angle of distribution
5 deg.," the actual distribution
e deflection ahead of the wheel
nded at an angle of about 65 deg.

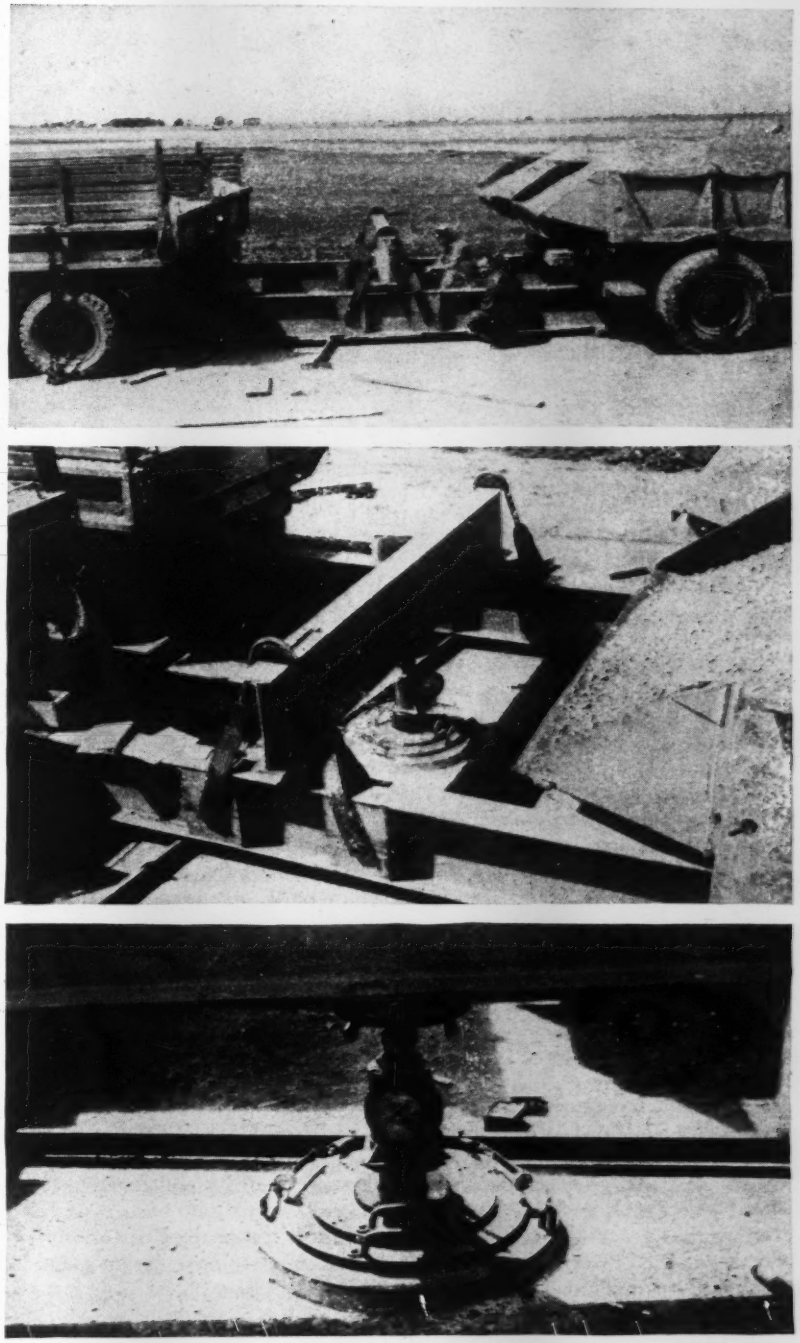


Fig. 1. A loading frame made of heavy I-beams held down by four trucks, had a transverse beam under which a jack developed a 50-ton load on a circular plate.

The report points out that "for a given thickness of pavement plus base, the deflection increases rapidly with the wheel load intensity. The deflection of the bottom of the base under dynamic and static wheel loads furnishes the best indication of what action takes place in the subgrade."

A permissible deflection of about 0.05 in. for a 10,000-lb. wheel load is the maximum allowable in highway practice, the report points out, and where a large number of load repetitions (a million or more) is anticipated the permissible deflection is probably not more than 2 or 3 hundredths of an inch. Because of the lesser number of repetitions (20,000

Fig. 2. A 54,000-lb. load on left rear wheel was obtained by adding scrap iron to one corner of loaded scraper already carrying 40,000 lb. on each rear wheel.

to 30,000) anticipated on runways, deflections of 0.05 in. under each application of a 10,000-lb. wheel-load, the report says, "probably would be permissible providing the flexible pavement is good and does not become brittle."

After traffic tests had been made with 25,000 lb. wheel-loads up to a maximum of 5,772 trips and, on another portion of the runway, with 40,000-lb. wheel loads up to 8,002 trips, measurements were made to determine the amount of grooving and the extent of cracking and failure. The depth of the grooves was measured from a 14-ft. straightedge. When the depth increased to about an inch, fine longitudinal cracks usually could be seen in the wheel tracks after the surfaces had been swept, moistened and allowed to dry. These fine cracks were regarded as a sign of incipient failure. When "map cracking" accompanied the longitudinal cracks and could be clearly seen without special preparation, the pavement was rated as "failed." At this stage the groove usually had reached a depth of 1½ to 2 in. "Complete failure" was recorded when the pavement cracked into blocks and the blocks were punching down and working more or less independently under each load repetition.

In the traffic tests, the pavement failed to the 24-in. base thickness under 5,772 trips of the 25,000-lb. wheel-load and indications were that the failure probably would have extended to the 30-in. thickness under 20,000 repetitions. This indication agrees closely with the 32-in. thickness specified for soils showing a California bearing ratio of 3 percent, according to the method of analysis prescribed in the engineering manual used by the California Division of Highways. These conclusions assume that design will be governed by the worst moisture condition, namely, saturation.

Under 8,000 trips of the 40,000-lb. wheel-load the pavement failed to the 38-in. thickness and the report states "it appears that a thickness of 36 to 40 in. would be required to support this wheel-load for 20,000 repetitions."

These traffic tests, as well as tests of other types, were reported as giving confirmation, in general, to the values and results that would have been obtained by use of the foundation analysis methods now employed by the Corps of Engineers for design of flexible pavements. The report, therefore, concludes, "it does not appear that the tentative design standards (as used by the Corps of Engineers and the California Division of Highways) are over conservative for the class of soil and base material used on this test project." (For additional details of these design standards, see *ENR* Jan. 28, p. 67.)

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Addenda—bearing tests

The method of rating the bearing value of soils, used in the airplane runway tests at a California airfield described in the foregoing article, was developed for use on California highways, chiefly by O. J. Porter, senior physical testing engineer, division of highways. During the development of this method there was opportunity to observe results on a very extensive highway system and

hence endeavor was made to
and adjust the method to suit
materials. The California
method, as it has come to be
is a later development of
that have been used for more
decade on California highways
application of one phase was
in *Engineering News-Record*,
1936, p. 804. Because of the
focusing of attention on airport
struction in wartime, the
tracted widespread attention
the past year.

Early in 1942 Army
asked a pointed question:
runways paved with
crete in eastern United States
more frequently than did
runways under similar service
west coast? The answer to this
to be that on the west coast it
become the custom to first test
bearing value of the subsoil by
California method and then to
pavement and base in
with the findings.

As a result, Mr. Porter was
to Washington to discuss this
with Army engineers. Later, to
further in explaining methods
plying the tests and to
working knowledge of them,
by invitation of the U. S.
Department, Mr. Porter
five-day lecture course in
mento, Calif., which was attended
representatives from the various
sion offices of the U. S.
Department. These engineers, in
were to instruct the personnel in
district offices. During this
course the airfield runway tests
in progress and the methods
and the results attained there
observed and used in the discussion

The California method is more
curately described as a "soil
than as a "bearing-value test."
addition to rating bearing value
bearing ratios, it includes
tion of moisture content,
grain sizes, liquid limit and
index. The determination of
value is made with a small
pressing upon a sample of the
terial, first with the optimum
ture content for compaction and
when saturated. (A direct shear
is not included nor is actual
stress used in the determinations.

The method as a whole is
simple and easily applied. By
is called "empirical" because

rast with other tests that involve mathematical theory and more mptions. In other words, the fornia method has been developed nd for practical application.

her states have been working on same problem. Those who favor mathematical analyses have that the California method has limitations and does not apply to materials. Cited as an example of is beach sand which shows up poorly under the California method and would be ruled out if judged solely on this basis, although actually it is a good base material.

In reply, proponents of the California method point out that it is the simplest and most readily applicable of any thus far proposed and that when proper adaptations are made (as, in the case of cohesionless materials such as beach sand, the use of a counterweight to represent surcharge) can be made applicable to all classes of subsoils. Meantime the method is being widely used on the California highway system and by the Corps of Engineers in the study of new airfield locations. All essential principles of the method were adopted recently by the American Society for Testing Materials as emergency alternate standards for work of this type. These are not yet ready for distribution.

Revised Drinking Water Standards Adopted by Public Health Service

New standards of purity for drinking water recommended by an advisory committee appointed by Thomas rran, surgeon general of the U. S. blic Health Service, are contained the January 15, 1943 issue of *Public Health Reports*. The revised standards, which supersede those in effect ce 1925, provide for greater safety d potability of water supplies.

In recommending the adoption of revised standards the advisory mmittee made the following report: The requirements for drinking (and linary) water provided by common rriers for the use of passengers carried in interstate traffic, commonly own as the "Treasury Department rinking Water Standards," were last vised in 1925. Since that time many provements in water supply practice have been adopted with resulting creased uniformity of quality and fety to the consumer. Moreover, the ublic Health Service, in recent years, s been requested by the American ublic Health Association, the American Water Works Association, and e American Chemical Society to review the 1925 standards. Accordingly, e Public Health Service has undertaken a revision of the standards in rder to have them conform more losely to current requirements for ater supplies of attainable safety nd potability.

To carry out such a revision the urgeon General of the Public Health ervice, on February 27, 1941, appointed a special advisory committee composed of representatives of various federal organizations and scientific associations and including several members at large. A smaller subcommittee of Public Health Service officers was designated to prepare tentative suggestions for the consideration of the advisory committee.

After thorough consideration, the committee recommends the adoption of the revisions as set forth in the text herewith submitted. The principal changes now proposed are:

(1) A distinct separation of the text into: (a) that portion containing the statement of the standards, and (b) that portion constituting a recommended manual of water works practice representing the judgment of the technical sub-committee composed of officers of the Public Health Service. This portion of the text is intended to serve as a guide to the reporting agency and should not be considered as indicating additional requirements to be met for certification of the water supply.

(2) In the bacteriological section the use of 5-10 ml. portions or of 5-100 ml. portions is made optional; a minimum number of samples is to be examined monthly, the number depending upon the population served; the laboratories in which bacteriological examinations are made and the methods used in making them are subject to inspection at any time by the designated representatives of the certifying authority.

(3) Concentration limits for lead, fluoride, arsenic, and selenium are included as part of the standards and their presence in excess of the limits stated shall constitute ground for rejection of the supply. Limits in concentration that should not be exceeded, where other more suitable supplies are available, are given for copper, iron and manganese together, magnesium, zinc, chloride, sulfate, phenolic compounds, total solids, and alkalinity.

(4) The results of recent studies on the potential pollutional hazards existing in the water supply systems of our communities due to faulty plumbing practices, cross-connections, interconnections, etc., as well as the pollutional hazards which are due to faulty water plant and distribution system operational practices, any or all or which may jeopardize the safety of the water in the distribution system, have been adjudged as being of prime importance in the consideration of the requirements of these standards. The utmost care and consideration have been given to the inclusion of those provisions which would serve to detect possible contamination arising in the distribution system and thus lead to its correction to safeguard the traveling public.

The committee believes that, in general, water supplies to be eligible for certification should meet all (sanitary, chemical, and bacteriological) requirements of the standards and that definite failure to meet any one of them should be ground for rejection or provisional certification, according to the judgment of the certifying authority. However, it is realized that the statement of an official standard of drinking water quality, to be generally applicable, must be interpreted reasonably. The committee has attempted to take into consideration all aspects of the problem. It offers these standards with the recommendation that the judgment and discretion of the certifying authority be exercised in their application.

Copies of the new standards, with which is incorporated the manual of water sanitation practice, may be obtained from Superintendent of Documents, Washington, D. C. Price 5c. (Ask for *Public Health Reports*, Vol. 58, No. 3, Jan. 15, 1943).

Pipeline Crossing Built by Novel Method

***Contents in Brief**—To extend a 36-in steel pipeline across a river the sections were welded together, the weight of the pipe increased by adding reinforced concrete rings, and the ends of the pipe plugged. After the pipeline was pulled into place by two tractors, water was admitted at both ends and the entrapped air released by a 3-in. valve at the center of the crossing permitting the pipe to settle to a prepared bed.*

CROSSING A STREAM with a pipeline ordinarily is not unusual, but to extend a 36-in. water supply across a river at an eastern war project required some novel construction in that a 497-ft. section was assembled on land, weighted with cast-in-place concrete rings to produce the desired deflection, and then pulled into place.

The pipeline was needed to supply water to a war plant located close to the confluence of three rivers of moderate size. Analysis of these waters revealed that the flow of only one stream was suitable for the use desired, and that to cross one of the other rivers with the pipeline was necessary. At the point chosen for the crossing, the waterway was about 410 ft. wide with a maximum depth of 28 ft. Trenches in the banks of the river were excavated on the line of the pipe for a distance of about 50 ft.

A $\frac{5}{16}$-in. thick welded steel pipe, 36-in. in diameter and delivered in 36-ft. sections, was used. Before assembling any of the pipe, an area was graded level for about 550 ft. in length on the extended centerline of the crossing. The pipe was rolled to this plot and raised on blocks about 6 in. above the ground. Then a number of the pieces were welded together, until there were three long sections, measuring 179, 178, and 140 ft., respectively.

Obtaining sufficient deflection

The longest of the sections was jacked up until it was supported only at the ends. Although the section bent under its own weight, the deflection was not sufficient to conform to the grade of the final resting place on the bed of the river. Accordingly, this section was weighted with bags of cement until the desired deflection was attained; this revealed that an additional weight of 10[illegible] lb. per [illegible] was necessary. This additional load was added by placing reinforced concrete rings each weighing 1,20[illegible] lb. about the pipe at approximately 12-ft. intervals.

As the pipe was made from steel sheets 6 ft. in length, the 12-ft. spacing of the concrete rings resulted in covering each second welded joint and thus added strength to the pipe. Likewise the reinforcing in the concrete rings was tied to the pipe by welded clips, increasing the resistance of the pipe to collapse under external pressure. While the concrete rings were being added, the three long sections were welded together to make one continuous 497-ft. length, and a plank skidway was placed under the pipe. Also a timber skid was added under each concrete ring to facilitate sliding. At the end of the pipe line nearest the river, a steel bulkhead equipped with a door was installed. In the other end was placed a wooden bulkhead that was reinforced by an angle iron on the back and equipped with an eyebolt to permit removal of the bulkhead with the pipe in place.

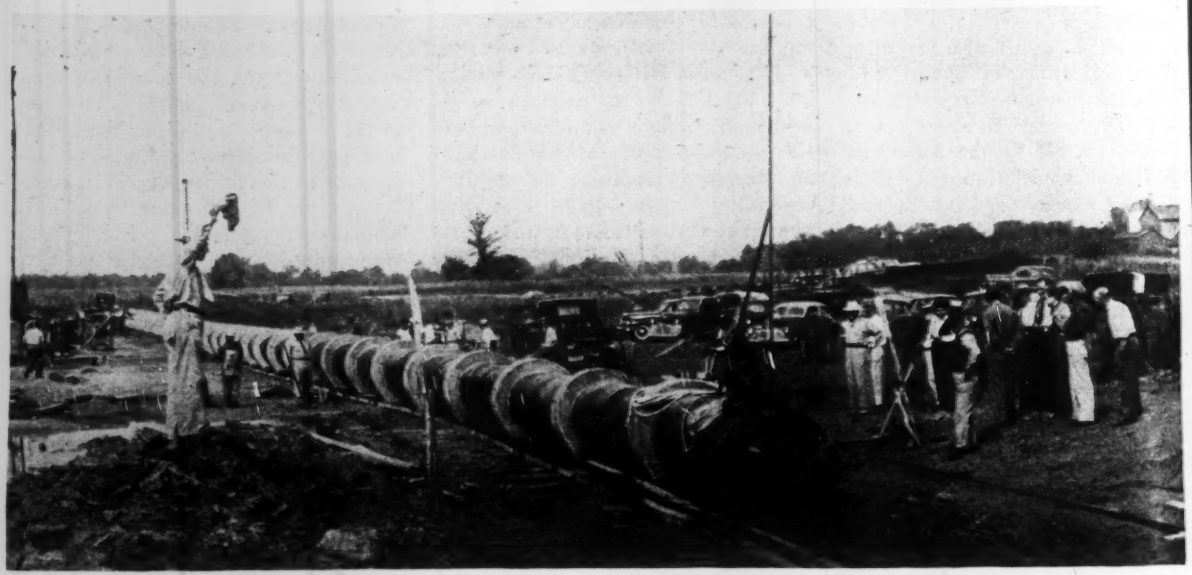


Fig. 1. Sliding along an oiled skidway, a 497-ft. section of pipe complete with concrete weights is pulled across the river. Plug in near end contains a small door. The upright rod behind the plug was used to guide pipe into position. The 3-in. vertical pipe extending above head of worker at left carries an air release valve.

short 3-in. dia. nipple was welded the top of the pipe at the center s length. To this nipple was at- ed a 3-in. pipe about 24 ft. in th and equipped with a quick ing valve. At each end of the eline and about 1 ft. from the head, two pieces of $\frac{3}{4}$-in. dia. rod e welded to extend outward from pipe and to serve as markers when pipe was submerged.

stiffback, the center of which $2\frac{1}{2}$ ft. from the center of the e, was placed between the two con- e rings nearest the middle. The back was made of 4x4x$\frac{3}{8}$-in. an- s welded in place. When the two ns, planned to hold the pulling aves, had been welded to the end irest the water, the pipe was ready be drawn across the river.

Preparation of river bed

While the pipe was being assem- d for its launching, a resting place the bed of the river was prepared. this work a 3-yd. dipper dredge a 20-ft. wide channel across the er. When hard material was en- ntered, the dredge excavated 6-in. low grade; where soft soil was nd at theoretical grade, excavation ntinued until this was removed.

As soon as the dredge had com- eted excavation half way across the er, a derrick boat worked behind e dredge and placed No. 4 stone in e excavated channel. In the center

Fig. 2. Reinforcing for concrete rings was welded to pipe to increase pipe's resistance to collapse under external pressure.

of the river channel, where consider- able soft material was encountered and it was necessary to excavate sev- eral feet below grade, or to a depth of over 30 ft. below the water sur- face, dump scows were used to place the stone bed. The dredge was used to grade the stone deposited for the bed, and with careful sounding the stone was graded at all points to within 6-in. of theoretical grade.

Tractors pull pipe across river

To pull the pipe across the river two tractors, each of 96-hp. capacity, operated in tandem on the far side of the river and about 200 ft. from the river bank. A two-part line was used: one end was attached to the tractors and the other to a deadman prepared by placing concrete around the base of a clump of willow trees a few feet off the centerline of the pipe. To reduce the pull required, the plank skidways under the pipe were covered with grease.

As the tractors pulled the pipe into place the dredge, with its bucket and dipper stick removed, worked on the downstream side of the pipe line. The hook of the dredge was placed on the line of pipe in readiness to be attached to the cable sling from the stiffback. The derrick-boat worked on the upstream side. Both pieces of equipment had capstans that were available for changing the alignment of the pipe.

The pipe was pulled 4 to 6 ft. at a time; as it entered the river it floated half submerged. As soon as the entire pipe had been drawn into the river, the hook of the dredge was attached to the cable sling from the stiffback and a manila line was tied to the stiffback from the capstan of the derrick boat. The wooden bulk- head in one end of the pipe was re- moved and the door in the steel bulk- head at the other end was opened.

As water came into the ends of the pipe the release of air was con- trolled by the quick-closing valve on the 3-in. pipe; the center of the pipe- line was gradually lowered by the dredge until the entire 497-ft. section

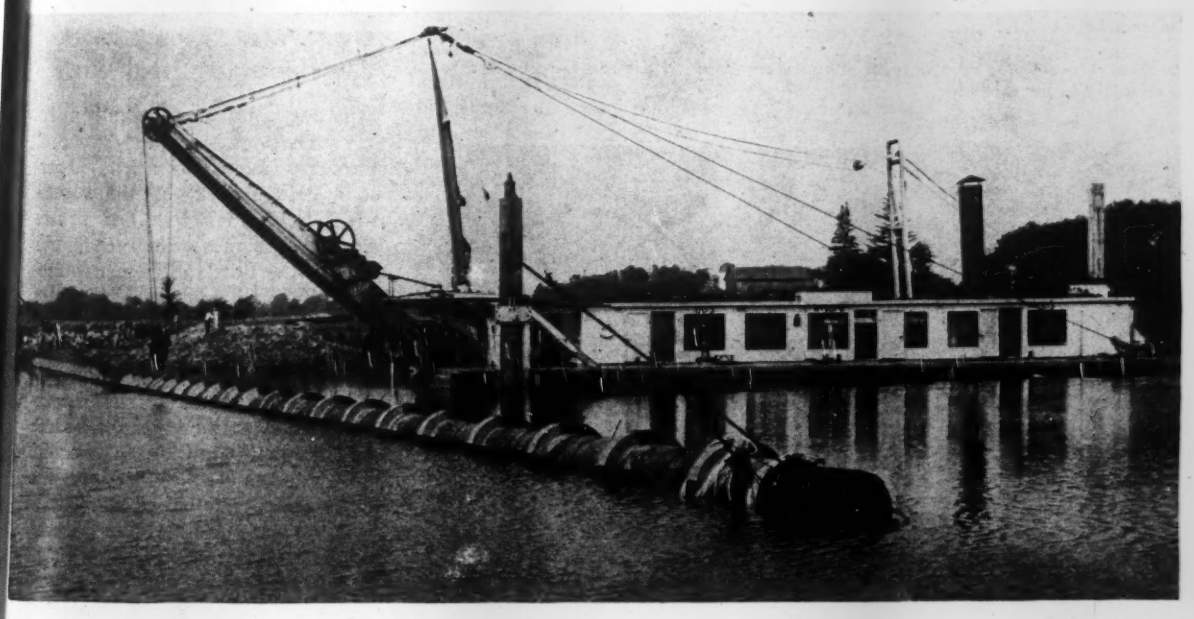


Fig. 3. Entire length of pipe in place ready for dredge to hitch to stiffback at center. Pipe will be turned slightly clock- wise to bring air valve near stiffback and guide pipe vertical and keep them above water.

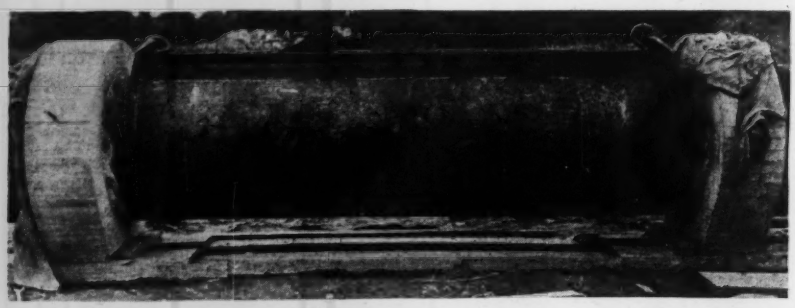


Fig. 4. Stiffback at center of crossing consists of two 4x4x⅜-in. angles welded to pipe. Concrete rings, on 12-ft. centers, are typical of those for entire pipe. The bolts or studs extending outward from pipe were welded to the sections to hold the forms in place in the event it was decided to place concrete around and over the pipe for a counter-weight after the pipe was in place.

Fig. 5. Concrete saddles of the type above were used to anchor the pipeline in place on the bed of the river.

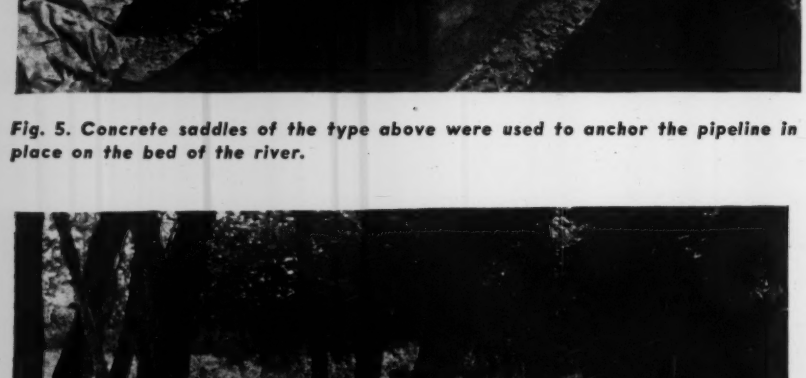


Fig. 6. To provide a deadman cable anchor for pulling the pipeline into place a concrete block was built around a group of willow trees.

rested on the prepared bed. Next the 3-in. pipe was removed and a cap was attached to the nipple by a diver, who also removed the plugging from the pipe. The procedure of pulling and sinking the pipe required 1½ hours.

Following the sinking of the pipe, concrete saddles were placed between the concrete rings to prevent the pipeline from rising to the surface in the event it should be dewatered for any purpose. These saddles consisted of blocks of concrete formed to fit the circle of the steel sections and they were tied together with a cable near each end. After the saddles were in place No. 4 stone was deposited around and under the bottom of the pipeline at the direction of a diver. As a final protection, 40- to 80-lb. riprap stone was placed on top of the main to protect it against movement by river currents.

The total time required for trenching the river, preparing and sinking the pipeline and backfilling around and over the line was about twelve weeks.

Construction of the pipeline was carried by the Syracuse District, U. S. Engineers, Lieut. Col. John H. Elleman, district engineer and Maj. A. E. Perkins, area engineer. Because of the nature of the work, the location of the project cannot be divulged, nor can the contractor be mentioned.

Concrete Paving Work Continues at High Rate

Stimulated by considerable activity in airport paving, the volume of concrete pavement, rose nearly 50 percent in 1942, from 84 million square yards in 1941 to 134 million square yards in 1942, according to figures issued by the Portland Cement Association. Though concrete highway work fell from 34 million square yards in 1941 to 23 million in 1942, and street and alley paving decreased some 2 million square yards, the increase in airport paving in the same period, from 30 million to over 92 million square yards, brought the total to 133,896,550 for 1942.

That activity in concrete airport pavement is continuing, is indicated by comparing the 2,489,767 square yards for January, 1942, with the 5,065,170 square yards laid in January, 1943.

Postwar Highway Development

• Plans for highway development in the postwar period that are being considered by leaders in thinking with respect to highway needs were outlined to the Association of Highway Officials of the North Atlantic States recently by G. Donald Kennedy, former head of the Michigan Highway Department and now vice president of the Automotive Safety Foundation, Washington, D. C. Mr. Kennedy was appointed to his new position to bring to the foundation an experienced highway engineer to direct the enlargement of its activities to include promotion of greater safety in the operation of motor vehicles through advocacy of major improvements in highways. Extracts from his talk are given below.

The immediate major task of the Automotive Safety Foundation is to serve war highway transportation. This involves the stressing of adequate facilities for maintenance of our basic trunkline and important secondary highways, and work to obtain needed access roads to military installations and war production factories. The larger goals of the foundation, and I am sure every state highway official in the nation, with regard to highways, is postwar highway development.

This program will stress, as the nation's fundamental and most extensive postwar public works requirement, the expansion of our war-interrupted trend toward the kind of modern motorways that will rebuild and revitalize our cities, and that will vastly alleviate the terrific economic and human toll involved in urban congestion.

A second phase of this postwar program will be to encourage the building of inter-regional limited-access expressways connecting our larger population centers, where traffic volumes justify such treatment.

A third phase—and the one requiring by far the largest financial support—will be the rebuilding of existing roads, and progressive improvements in their standards. This will include the normal replacement programs already seriously interrupted by war and the rebuilding of routes which have been battered to untimely destruction by the overburden of war traffic.

A fourth phase will be to develop a system of highway terminals to serve air, rail and water transport, and thus keep pace with the postwar evolution in our combined transport.

In discussing the transportation developments we can expect after the war, and what preparations our highway administrators should make for those developments, I want to go further than merely reviewing the scientific approach that highway engineering experience and study has made available to us in recent years.

Definite action needed

Highway engineers are fairly agreed, at least in fundamentals, on what modern design practice should be followed if we are to keep pace with transportation advances. I do not want to limit my remarks to general planning and prophetic language. Those are good and necessary. But, they are far from being good enough. They must be implemented by definite and immediate action, which should include these three steps:

(1) The $179,000,000 in federal-aid highway balances now credited to the states, and which because of war conditions cannot be spent for construction, should be made available to the states for immediate use in making construction drawings for postwar projects and for immediate acquiring of as much needed right-of-way as possible, in keeping with the findings of the highway planning surveys.

(2) Our state highway departments should proceed quickly to set up construction drawings and acquire right-of-way, for needed rebuilding of existing routes after the war, and for urban and inter-regional expressways.

(3) A constant inventory should be taken regarding progress on construction drawings and right-of-way acquisition, to stress the goal of being fully prepared to let construction contracts on the largest scale in history the moment the war ends.

And now, to show why this program is so vital today, let us see what we shall face when war ends, and how our highway program must conform to those postwar conditions:

First, the impact of peace will be sudden and widespread. Soldiers will be coming home. War workers will be idle as factories close to retool for peacetime production. There will be a period of readjustment when the immediate needs will be fast development of worthwhile public works, of the type that also will help speed the return to a sound postwar economy.

New highways qualify fully for that job. Nearly three-quarters of every dollar spent on roads goes for employment. And we have seen from past experience that such highways are not a drain on the taxpayer's pocketbook. They are productive enterprises.

Large replacement job

The second postwar condition we will face will be a tremendous backlog of replacements on existing highways—replacements that must be made quickly if we are to protect the investment of billions of tax dollars already made in our streets and highways, and which are an outgrowth of deferred replacements of battered, war-scarred roads, or are made necessary by the fact that the useful life of many of our first great highway projects has ended.

The regular program of annual rebuilding of obsolete roads has been halted by war. Even the regular maintenance program has been sharply curtailed. Working together, these two factors are hastening abnormally

the decay of roads. And since this total mileage is so great, reconstruction will require far more funds than will the lesser mileage of urban and inter-regional expressways.

You can depend on it that London and Stalingrad, in their rebuilding after the war, will rise as better planned and constructed cities. So too, we should prepare now to abandon after the war some of the paved wagon trails now breaking up and apply reconstruction funds to improved design and logical relocation of these routes.

Congestion around cities

The third postwar condition will be a resumption of the trend toward more vehicles on the road, and particularly of the trend toward greater yearly mileage per vehicle. This means, of course, that congestion on urban roads, and on those linking large population centers, will be even more critical than before the war.

Within a few months after war ends, we can expect mass production of 1942 models, with few basic changes. Changes require delay for extensive re-tooling of plants, and the first need will be for employment, as well as for new cars to replace those wearing out today.

Major changes in vehicles will come a year or more later, depending on various factors we need not go into here. Metallurgical advances, new high-octane gasoline, plastics, manufacturing advances brought on by war work—these will combine to bring about a light, spacious car, more economical to buy and operate. And that will mean we can expect more vehicles, with even greater jumps in average miles traveled per car.

Short trips predominate

Let us never forget, though, that the field of the motor vehicle is predominantly that of the short trip—from home to work, or to the grocery, or a nearby golf course. Eighty-four percent of all motorists average less than 20 miles per trip. With trucks, it is the same short distance, from the railroad terminal to the factory, from wholesale outlet to retail store.

Sure, there are longer trips. Five percent of our highway trips are over 50 miles. Two percent are over 100 miles. We need good roads for those exceptions. But we must concentrate on the cities, and on selected inter-regional routes where traffic volumes are heaviest.

Here in the North Atlantic States is our greatest inter-regional bottleneck. The route from Boston to Washington, taking in the nation's two largest cities, has the largest traffic band on earth. An inter-regional expressway on that route should be the start of a Maine-to-Florida motorway. Traffic all along the route is sufficient to more than justify it.

Another expressway should extend from Philadelphia through Harrisburg to join the Pennsylvania turnpike, and westward through Pittsburgh to Cleveland and Detroit to Chicago. The nation's largest commercial traffic band is the Detroit-Toledo route, now carrying great quantities of steel from furnace to munitions factory. An expressway is urgently needed there.

Bold planning required

And none of these new roads should blindly follow old locations. They should, where proper surveys indicate, strike out boldly in new locations. They should provide quick access to the heart of the city, where the majority of traffic approaching the city wants to go. They should provide also a method for carrying through traffic efficiently past the city. For congestion exists in every city in America.

In some cases, limited-access beltlines encircling the city should be built, creating by-pass routes as well as connections between main radiating arteries.

A certain amount of city decentralization will take place under the transportation changes that will take place after the war. This is all the more reason why the center of our cities should be opened to more easy access. The city's industrial and economic and cultural and residential concentrations will remain as the main terminal points in a highway network which links all our residents, urban and rural.

The farmer must deliver products to the city market, and over one-third of all truck freight in America must continue to move from the city to the farm. The city resident still wants to drive out into the country, but he will do less driving if he faces accidents and congestion between his home and the city limit. Undue co[n]gestion keeps commodi[ty] distributi[on] costs high, and the cos[t] shared b[y] all of us.

Too much de[lay]

Our first job is to [get] our ow[n] house in order. That [m]eans bein[g] ready to let construct[ion] bids th[e] moment war ends. It m[e]ans having much necessary land alre[ady] acquired for right-of-way. But [la]rge-scale soundly engineered proj[ects] cannot leave the drawing board[s] in a day or even a year. And right-of-way ac[-] quisition also is not a one-day job. Delay is a sad mistake today.

Only half our state highway de[-] partments thus far have submitted any postwar plans to the Public Roads Administration, under the planning program of 1941. Those plans cover only selected high-type roads. They are not a drop in the bucket, compared to the real job we will face when war ends.

How, then, can we make up for lost time?

First, we must have a united program, with all states participating. We must assemble the facts to substantiate the program, and lay before Congress the proof that all existing Federal aid balances credited to the states, and which cannot be spent on normal programs during the war, should be available immediately for acquiring right-of-way and setting up projects in final detail.

Dangers of unpreparedness

There is grave danger, too, if we are unprepared, that we will see an end to the cooperative federal-state highway program that up to now has achieved in America the most far-reaching transportation improvement the world ever knew. There is grave danger also that the contract system of highway construction, which has proven the soundest and most economical system of all, will be lost, and a work relief program substituted.

We are confident that your efforts, and what help we can give, will carry America into a vast new era of modern highway design and construction, worthy of a world that is undergoing in stress of war a transportation revolution that will stimulate travel and traffic of all forms to undreamed-of proportions in the peace we are working and praying for today.

War Emergency Repairs In Great Britain

C. F. Greeves-Carpenter
New York, N. Y.

***ntents in Brief**—Methods and materials employed abroad in making airs to water supply, transportation and other public utility facilities, dicate new time- and labor-saving techniques that may be useful in this ntry. The author has made several trips to Great Britain in the last two ars and reports his observations.*

ERICAN MUNICIPAL engineers and ntractors may never have occasion make emergency highway, trans-rtation and public utility repairs e to bombings, yet the splendid rk that has been done in Great itain will prove of interest and may ssibly serve as an inspiration ould this country ever experience mbings. A resume of work per-rmed in England will at least give se to thought and possibly to the rmulation of plans whereby emer-ncy repairs could be expeditiously d economically effected.

Various sections of England, of urse, have been badly blitzed but no means so disastrously as Nazi opaganda would have the world at rge believe. On recent visits to arious parts of England I have seen any badly bombed areas — areas at could by no conceivable means considered as of military impor-nce—but the gutting of buildings as, for the most part, been due to ncendiary bombs which have started erce conflagrations.

The water system, often seriously nterrupted due to broken mains, has een unable in the past to cope with e great number of fires started, but oday Great Britain is prepared for ractically any emergency thanks to e foresight of her engineers and aintenance men. Nowhere, even in e earlier blitzes, have highway facil-ies, or those of the underground or ailway systems, been seriously inter-upted for any appreciable length of ime—a fact that is due entirely to e efficiency with which emergency epairs have been effected.

In the limited confines of an ar-ticle on general wartime emergency repairs, it is not possible to deal at length, or even to mention, all meth-ods and materials which are em-ployed. Emergency repairs, for the purpose of this article, may be con-sidered only as of a temporary na-ture and solely for the objective that transportation and public utilities may be conducted as near normal as possible, while repairs of a more per-manent nature are being effected as time, labor and materials permit.

Water supply essential

Emergency water supply embraces consideration of access points to rivers, streams and lakes, the use of stormwater culverts, reservoirs and swimming pools, as well as the con-struction of tanks and the utilization of every possible space for static storage of water.

Of primary importance in defense against bombings—aside from the more obvious ones of barrage bal-loons, anti-aircraft fire and fighter planes—is an adequate supply of water. The control of fire must first be considered from the viewpoint of delivery of water and this necessi-tates foresight in the planning of emergency supplies and in ready availability of materials for repairs. Secondly, plans should be formu-lated in advance to include emergency repairs so that delivery of water would not be stopped.

The provision of static water for use in fighting fires has been given special attention by the responsible civil authorities in Great Britain. In Bristol alone some millions of gal-lons of water have been stored in tanks, reservoirs and the like in stra-tegic points throughout the city and its environs. In addition, access roadways have been built so that water could be pumped from the river at all tide levels, and baffles have been erected to provide reason-able storage and to secure adequate depth for pumping.

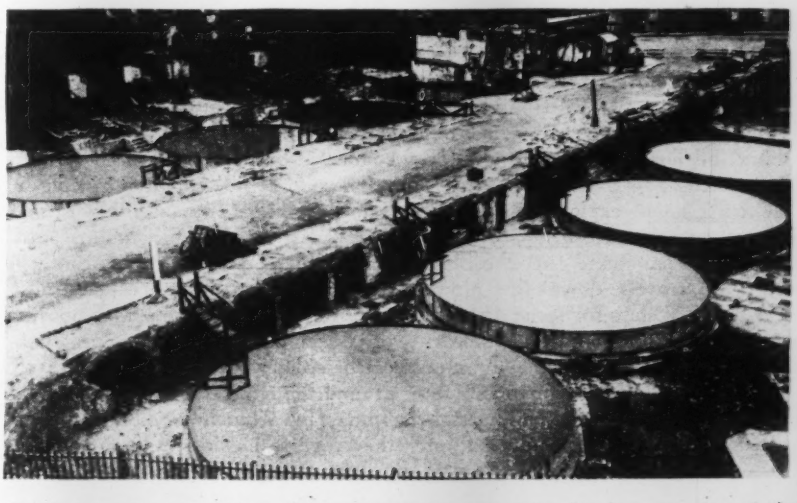


Fig. 1. Intensive air raids on England taught many defensive lessons—one of the most important being the need for immediate, uninterrupted flow of water to fight fires. As a result, many static water storage tanks have been installed, one example of which is shown here.

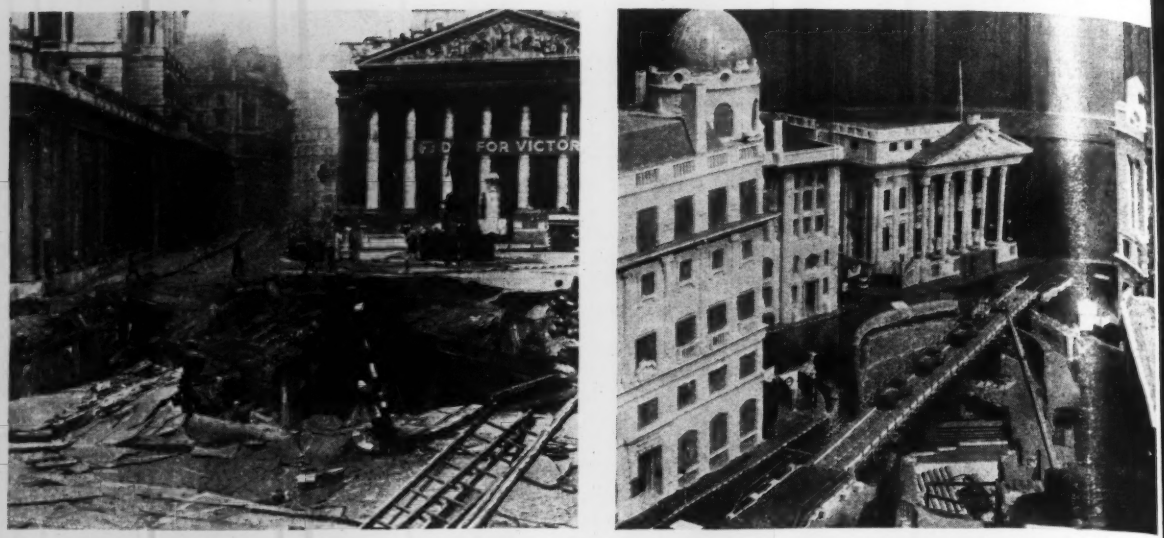


Fig. 2. London's largest bomb crater (left) which occurred in banking district. The bomb penetrated the surface and exploded in a station of the underground system. A model of the repair operation, showing how the crater was bridged to maintain traffic, is shown at the right.

The Ministry of Home Security recently has set emergency standards for the quantity of water to be stored in every square mile of a city. Some of the waterworks departments maintain a squad of motorcycle dispatch riders, with one or more members on duty each night, so that in event of failure of the telephone system, an immediate means of contact between the various points on the waterworks system could be established.

Orthodox techniques for the jointing of broken water mains which involve the use of lead in any form is, of course, too slow a procedure to employ in making emergency repairs where the mains are shattered by bombs. Therefore consideration has been given to alternative and quicker methods as promptness in re-establishing the flow of water is vital in home defense.

When a bomb explodes in the vicinity of earthenware drains or sewers, it has been found that the blast invariably travels down the pipes, shearing the collars for some distance beyond the actual location of the explosion. In such instances, a water test is made at the nearest manholes before steps are taken to make permanent repairs. The jointing of broken pipes, however, is only a part of the average job, for a certain amount of excavation is invariably involved.

Repair procedures may be classified as those employing fully mechanical methods, and those involving the use of plastic or liquid caulkings. Rubber rings may be compressed by screw threads or flanged collar so that an impervious seal is quickly formed. The ease and speed with which such joints are made is a decided advantage, particularly as such work involves minimum labor, and the flexibility of such joints has been found to compensate for any settlement that occurs after a bomb crater has been filled.

There are, of course, many other mechanical methods for effecting joints in broken pipes, including one which is used in the United States, namely, a sleeve (fitting loosely over the ends to be joined) held firmly by two rubber rings tightly drawn in place and fastened by end-flanges connected by bolts.

There is a wide range of plastic or liquid caulkings adapted for effecting emergency repairs, the majority of them being employed with a prefabricated gasket that is first caulked into the joint cavity. For the poured joints an extemporized or prefabricated collar naturally is necessary around the end of the spigot. Plastic fillings have much in their favor as they require no heat, nor any device to keep them in position during hardening, and may be used on a wet pipe with as much ease as on a dry one. It takes time, however, for such fillings to harden and be fully impermeable.

Poured fillings require to be melted before they can be placed in the joint cavity. This fact naturally mitigates against their use in emergency repair work, especially as most of this must be done under conditions which can best be described as far from favorable. Poured fillings, therefore, are not generally considered as suitable, and reliance has been placed on fully mechanical means of pipe-jointing.

Supplies of repair materials, reducers and bends of sizes suited to the various sizes employed throughout the particular system, as well as some mains with mechanical joints, are usually placed at strategic depots so that quick service can be rendered as soon as a bombing attack is over. In some cities a stock of flexible jointed pipes, for use as temporary connections, is kept available, and steel tubes are also held in readiness in most cities and towns in the British Isles so that bomb craters may be quickly spanned.

In Bristol it is the practice to dose fractured mains with 10 ppm. of bleaching powder. Where the mains are contaminated, it is customary to treat them with a portable chlorinator using as much as 50 ppm.; sometimes a stirrup pump is utilized to introduce the chlorine through the hydrant.

The maintenance of water supply has been dealt with first as, aside from the military and aerial protec-

ties, it is the one essential buildings from being com- tted by fire. There is, of need to more than men- ssing the necessity for hav- d sand available to every r and adjacent to every that fire from incendiary y be extinguished as soon mbs drop. Often the at- so swift, and the bombs so that it is next to impos- ope with them before con- are started.

rgency street repair

raids, volunteer workers at- the street department in ies, are used to place lamps , debris and gutted build- well as to erect "Street igns. In cooperation with department, these volun- divert traffic to safe routes. on as the "All Clear" is it has become standard prac- English cities to make an onnaissance of all incidents affect transport or public cilities, as well as to make on unsafe buildings. In th and other areas, military has been prearranged and civil authorities in the clear- streets and in demolition

portant streets or highways been closed due to enemy re, of course, repaired and to traffic at the earliest pos- ment. Such work embraces ning of bomb craters and neral repairs, usually of an cy nature, so that traffic, vehicular or pedestrian, can nterruptedly while repairs of permanent nature are being

ype of bomb, and more par- the type of fuse, causing losion has much to do with and extent of the damage. of a medium-light case type oyed quite extensively by the their blitzkriegs and these te through the concrete crust highways in a more or less ole but burst with full force feet or more below the sur- ending on the terrain.

al damage has been found to ively slight but concrete slabs, as 8 to 10 ft. square, are up and a cavern formed at the site of each such explosion. In many instances the upheaved concrete slabs would be intact or only slightly shattered, and would even be attached to the roadside by their reinforcements. Equipment for removal or breaking up of debris calls for heavy wirecutters for cutting the reinforcement and for compressors operating pneumatic hammers in order to reduce the slabs of concrete to sizes that can easily be handled. Broken pieces are then used as rubble pitching in temporary repairs to the craters.

During and immediately after the worst raids over London, the streets which were hit—and by far the great majority escaped any direct injury—were littered with debris from gutted buildings, with torn, twisted street car lines, broken, upheaved pavement, wrecked vehicles, etc., so that the complete scene became an indescribable chaos. In a few days, or few hours, depending on the extent of the damage, all debris would be cleared away, craters spanned, water-mains, sewers, gas and electric lines, temporarily repaired, and traffic would resume its normal course.

Maintaining transportation

To the 80,000 people who make up the London Passenger Transport Board, which serves an area of 2,000 square miles and controls the underground railways of London, all the street cars and trolley buses, as well as some 64,000 buses and coaches, belongs every credit for the magnificent manner in which they circumvented Hitler's Luftwaffe attempt to paralyze London's enormous transport system.

In spite of bombs, blasts and bewilderment, this huge transport system was kept running during those terrible days and nights of blitz. Workers were able to get to their jobs and return to their homes with relatively little inconvenience, and the role of the underground stations as air-raid shelters did much to give a degree of peace and security of mind to the thousands of all ages and classes who slept on rugs spread on platforms or on the metal bunks stretched in tiers of three along the walls of the platform. In spite of the fact that many still use the underground as a hostel at night, Londoners today go about their business and their pleasure with but little thought to air-raids.

The crippling of such a large transport system would be a legitimate military objective as it would disrupt the industrial life of the city, and it was one that the Transport Board intended to guard against by every means in its power. A survey was made of all their properties so that wherever feasible they could be strengthened against bombings, air-raid shelters were built, and the glass in all conveyances was covered to prevent, insofar as possible, injury to passengers from shattered windows.

A complete plan of action was early drawn up so that immediately after a raid all debris would be cleared up by a night gang in readiness for the emergency repair gang at dawn. Repair equipment was placed at key positions to facilitate quick delivery to the bombed areas, and it included, besides actual tools, heavy timbers, steel work, reinforced concrete arched sections for tunnels (of which great use has been made), rails, etc. It is due to this preparedness that the services have been maintained in such excellent condition.

The emergency control office, with a complete duplication of the central above-ground office telephone system, was built underground. It included a control panel so that instructions could be issued without delay that the flood gates at the end of the under-river sections of the system could be closed should that be deemed necessary. It was a wise precaution as the flood gates did have to be closed when a bomb landed at a location where grave damage would have been done without such foresight.

London's largest crater occurred outside the Mansion House, the Bank of England and the Royal Exchange when a bomb landed at that busy point. Much publicity has been given to the difficult engineering feats involved in making emergency repairs to the area. The bomb penetrated the surface and exploded in the large hallway that housed the ticket offices and head of the escalator system that gave ingress and egress to the underground platform which form London's busiest subway station. The explosion killed some passengers awaiting trains on platforms 100 ft. below the surface. Approaching trains were stopped immediately.

Military authorities estimate that the bomb weighed 1,400 kilos and in exploding it opened up a cavern 120

Fig. 3. Air-raid shelter facilities located in unused tunnels of the underground system. The attendant is operating a portable air-purifier.

ft. long by 100 ft. wide. In less than an hour and a half a crew of 300 men were put to work with five cranes, eighteen compressors, twenty-five lorries, a bulldozer and six oxy-acetylene cutters. After a day and a night of herculean effort, the central line itself was opened to traffic. A timber trestle bridge was completed over the crater in four and a half days and for seven weeks, while the area was being permanently re-instated, the bridge carried some 39,500 buses and approximately 150,000 other vehicles, as well as some millions of foot passengers.

During the London blitz a direct hit was made by a high-explosive bomb right over one of the underground system's twin tracks. The first step that engaged the attention of the construction engineers was the temporary shoring of the sides of the crater. Next, it was decided to drive steel sheetpiles on either side of the tunnel so that they were firmly anchored in the ground several feet below the level of the rails and these were further supported by horizontal timber struts to offset any possibility of a cave-in.

It was then routine work to clear away the debris created by the blast, and to restore the rail service during week days. On Sundays, train service was suspended, buses being substituted above ground to forestall inconvenience to travelers, and the work below the surface was carried on without interruption. In areas where the brick lining of the tunnel was damaged, the inner ring of brickwork was removed and one of reinforced concrete substituted. In this particular instance the tunnel was completely wrecked and its arch had to be removed, new retaining walls constructed, and pre-cast reinforced concrete arches installed.

Pre-cast concrete bridges

It was early realized that provision would have to be made for speedy replacement of bridges and culverts that might be seriously damaged or completely destroyed as a result of enemy action. A shortage of timber in the British Isles naturally focussed attention on as wide a use of concrete as possible.

It was wisely decided to have units for bridge construction pre-cast so that there would be a minimum of delay in making essential replacements. At designated key points there are supplies so that bridges and culverts of pre-cast concrete units can be quickly furnished for single spans of a few feet in length to 38 ft., and similar units for multiple spans up to 35 ft. are also readily available.

Destroyed culverts up to 5 ft. span are replaced by telescopic corrugated iron pipes, but bridges of from 5 to 15 ft. span are replaced by timber spans.

Single track bridge spans of 15 ft. and 20 ft. are also constructed of pre-cast concrete units. Reducing dead weight to a minimum and economizing in the use of steel reinforcement, T-beams were designed in accordance with the Ministry of Transport Equivalent Loading Curve. The beams, made with a 1:1:2 mix, are so constructed that the flanges form the actual decking of the bridge and their close fitting is obtained by the use of two tie-bolts passing [illegible] slots in the beam ribs [illegible] below the flange. The ends [illegible] nate stirrups in the outside project from the upper side flange to form the keys for [illegible] The concrete deck [illegible] however unsurfaced unless the bridge used for more than a temporary ture when macadam would to obviate abrasion between joints that are placed between beams.

An inverted channel, 7½x[illegible] the concrete fence posts is [illegible] a 1¼ in. dia. tie-bolt to each T-beam. A ⅝ in. dia. bolt passed at curb level through fence post and it is then cemented the curb when the latter is cast dentally, the operation of cementing the fence tie-bolts to the curb the only cementing done on bridge is erected and does not per the flow of traffic.

The pre-cast concrete beams the 15 and 20 ft. spans, respectively are 17 ft. long (weighing 1.3 and 22 ft. long (weighing 1.9 Flanges for the former measure in. wide, 4¼ in. deep and the are 7½x7¾ in. deep, while the the latter measure 20½ in. wide deep and the ribs are 7½x9½ in. Bearings for the beams—pre-cast plates, 12 ft. long of 8x12 in. —are used singly or in duplicate necessitated by the type of Between them and the beams crete blocks are fitted and grouted give additional rigidity so that abutment is formed against the way fill. Principal reinforcement the spans consists of four 1 in. and five 1 in. bars, the V-joint tween the beams providing for eral distribution of wheel loads.

Time tests for erecting the pre-concrete bridges were made and was found that, even with the bridge to be so erected, it could only five hours from the time units were loaded in the trucks the bridge was erected and open to traffic. This time has been materially reduced since the men have come familiar with erecting the

Although the United States never experience the stark reality bombings, it may be possible to quire some new time- and labor-ing techniques from the experience gained by engineers and construction experts in the badly blitzed

Plate-Girder Erection at Hartford

R. M. Boynton, Associate Engineer
Robinson & Steinman, Consulting Engineers, New York

***s in Brief**—Methods generally reserved for high-level long-span ere used for the erection of the three-span, 840-ft. continuous plate- hich includes the longest girder span in the U. S. Piles for the bent foundations were driven through heavy steel bracing cages. deck was filled with concrete by a paver serviced by batch trucks directly on the grid.*

STRUCTION of the longest s plate girder span in the tates, by its unusual length bility, and its height above vanced the erection problem t of ordinary plate girder ion to that of a heavy, high- e-span type. Inherent were ulties of heavy falsework, quipment and jacking loads, required precision in align- members at thick and com- field splices.

antilever erection planned

iginal erection scheme for spans embodied the use of sework bents, one in each ree spans, which might be a semi-cantilever method. nts were of steel and were d on groups of timber piles e braced and capped with After the falsework failure nber 4, 1941, at which time f the erected girders of the of Span 13 and one 96-ft. or the north girder were lost Dec. 11, 1941, p. 837), the scheme was modified to in- e number of temporary bents ree to five and to substitute piles, bracing and caps in river falsework foundations. her construction originally for the bent in Span 15 was d and strengthened. The ction scheme, as shown in substantially reduced the ef- cantilever erection. Auxiliary e to uplift was required only 2, where it was applied by eight in the form of steel- iled on the structure near

ery of steel in barges ready for lifting directly to final position was impractical because the easterly river span is over a flat sandy slope of the river bed that is normally dry and upon which a construction road had been built by the substructure contractor. A railroad siding and limited space, available immediately under the southwest approach, was utilized for delivery and storage. From this point, steel was raised by a 150-ton locomotive crane to cars on a material track on the south cantilever brackets of the bridge. These cars were then hauled out alongside the main traveler by a stationary engine that operated an endless hauling rope for movement either way.

Traveler of 100-ton capacity

The main traveler, which weighed 167 tons and had a capacity of 100 tons at 80 ft. forward and 20 ft. side reach, was designed for this particular job and was one of the largest of its type ever used on bridge construction. It traveled directly on the top flange of the main girders, which were spaced 40 ft. apart, and had a wheel base of 43 ft. 9 in. This longitudinal base dimension was increased, when lifting with a forward reach, to 61 ft. 3 in. between front blocking and rear tie-down. The 100-ft. boom had a topping lift reeved to 21 parts of 1-in. wire rope and main falls reeved to 14 parts of 1-in. rope.

The four all-steel falsework bents, including the piles, were erected with the main traveler. The piles, of 12-in.

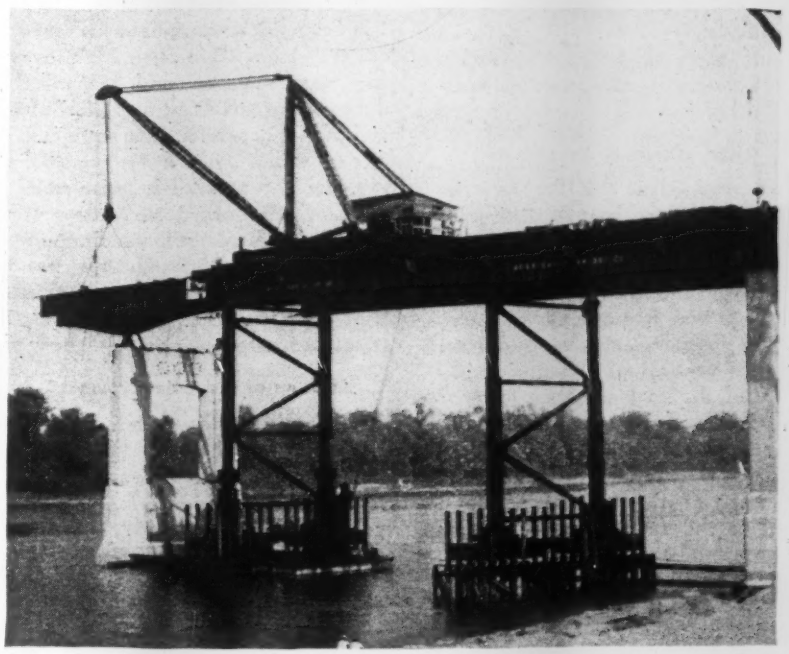


Fig. 1. Two falsework bents replace the single bent that was used in the unsuccessful first attempt at erection of the west 270-ft. span of the continuous girder. Split along a horizontal splice, the 17-ft. deep section over the left pier was erected in two pieces.

Fig. 3. Air-raid shelter facilities located in unused tunnels of the underground system. The attendant is operating a portable air-purifier.

ft. long by 100 ft. wide. In less than an hour and a half a crew of 300 men were put to work with five cranes, eighteen compressors, twenty-five lorries, a bulldozer and six oxy-acetylene cutters. After a day and a night of herculean effort, the central line itself was opened to traffic. A timber trestle bridge was completed over the crater in four and a half days and for seven weeks, while the area was being permanently re-instated, the bridge carried some 39,500 buses and approximately 150,000 other vehicles, as well as some millions of foot passengers.

During the London blitz a direct hit was made by a high-explosive bomb right over one of the underground system's twin tracks. The first step that engaged the attention of the construction engineers was the temporary shoring of the sides of the crater. Next, it was decided to drive steel sheetpiles on either side of the tunnel so that they were firmly anchored in the ground several feet below the level of the rails and these were further supported by horizontal timber struts to offset any possibility of a cave-in.

It was then routine work to clear away the debris created by the blast, and to restore the rail service during week days. On Sundays, train service was suspended, buses being substituted above ground to forestall inconvenience to travelers, and the work below the surface was carried on without interruption. In areas where the brick lining of the tunnel was damaged, the inner ring of brickwork was removed and one of reinforced concrete substituted. In this particular instance the tunnel was completely wrecked and its arch had to be removed, new retaining walls constructed, and pre-cast reinforced concrete arches installed.

Pre-cast concrete bridges

It was early realized that provision would have to be made for speedy replacement of bridges and culverts that might be seriously damaged or completely destroyed as a result of enemy action. A shortage of timber in the British Isles naturally focussed attention on as wide a use of concrete as possible.

It was wisely decided to have units for bridge construction pre-cast so that there would be a minimum of delay in making essential replacements. At designated key points there are supplies so that bridges and culverts of pre-cast concrete units can be quickly furnished for single spans of a few feet in length to 38 ft., and similar units for multiple spans up to 35 ft. are also readily available.

Destroyed culverts up to 5 ft. span are replaced by telescopic corrugated iron pipes, but bridges of from 5 to 15 ft. span are replaced by timber spans.

Single track bridge spans of 15 ft. and 20 ft. are also constructed of pre-cast concrete units. Reducing dead weight to a minimum and economizing in the use of steel reinforcement, T-beams were designed in accordance with the Ministry of Transport Equivalent Loading Curve. The beams, made with a 1:1:2 mix, are so constructed that the flanges form the actual decking of the bridge and their close fitting is obtained by the use of two tie-bolts passing [illegible] slots in the bea[illegible] ribs [illegible] below the flange. The ends [illegible] nate stirrups in the outside [illegible] project from the upper side [illegible] flange to form the keys for [illegible] The concrete decking, however, [illegible] unsurfaced unless the bridge [illegible] used for more than a temporary [illegible] ture when macadam would [illegible] to obviate abrasion between [illegible] joints that are placed between [illegible] beams.

An inverted channel, 7[illegible] the concrete fence posts is [illegible] a 1½ in. dia. tie-bolt to each [illegible] T-beam. A ⅝ in. dia. bolt [illegible] passed at curb level through [illegible] fence post and it is then cemented [illegible] the curb when the latter is cast. Incidentally, the operation of cementing the fence tie-bolts to the curb is the only cementing done when the bridge is erected and does not hamper the flow of traffic.

The pre-cast concrete beams for the 15 and 20 ft. spans, respectively, are 17 ft. long (weighing 1,[illegible] and 22 ft. long (weighing 1,9[illegible] Flanges for the former measure [illegible] in. wide, 4¼ in. deep and the[illegible] are 7½x7¾ in. deep, while the[illegible] the latter measure 20½ in. wide, [illegible] deep and the ribs are 7½x9½ in. Bearings for the beams—pre-cast plates, 12 ft. long of 8x12 in. [illegible] —are used singly or in duplicate, necessitated by the type of [illegible] Between them and the beams [illegible] crete blocks are fitted and grouted to give additional rigidity so that the abutment is formed against the [illegible] way fill. Principal reinforcement in the spans consists of four 1 in. [illegible] and five 1 in. bars, the V-joints between the beams providing for [illegible] eral distribution of wheel loads.

Time tests for erecting the pre-[illegible] concrete bridges were made [illegible] was found that, even with the [illegible] bridge to be so erected, it required only five hours from the time [illegible] units were loaded in the trucks [illegible] the bridge was erected and open to traffic. This time has been materially reduced since the men have become familiar with erecting the [illegible]

Although the United States [illegible] never experience the stark reality [illegible] bombings, it may be possible [illegible] quire some new time- and labor-saving techniques from the experience gained by engineers and construction experts in the badly blitzed [illegible]

Plate-Girder Erection at Hartford

R. M. Boynton, Associate Engineer
Robinson & Steinman, Consulting Engineers, New York

***s in Brief**—Methods generally reserved for high-level long-span ere used for the erection of the three-span, 840-ft. continuous plate- hich includes the longest girder span in the U. S. Piles for the bent foundations were driven through heavy steel bracing cages. deck was filled with concrete by a paver serviced by batch trucks directly on the grid.*

STRUCTION of the longest s plate girder span in the tates, by its unusual length bility, and its height above vanced the erection problem t of ordinary plate girder ion to that of a heavy, high- g-span type. Inherent were ulties of heavy falsework, equipment and jacking loads, required precision in align- members at thick and com- field splices.

antilever erection planned

riginal erection scheme for spans embodied the use of sework bents, one in each ree spans, which might be a semi-cantilever method. nts were of steel and were d on groups of timber piles e braced and capped with After the falsework failure mber 4, 1941, at which time f the erected girders of the of Span 13 and one 96-ft. or the north girder were lost Dec. 11, 1941, p. 837), the scheme was modified to in- e number of temporary bents ee to five and to substitute piles, bracing and caps in river falsework foundations. ber construction originally for the bent in Span 15 was ed and strengthened. The ection scheme, as shown in substantially reduced the ef- cantilever erection. Auxiliary e to uplift was required only 2, where it was applied by eight in the form of steel- iled on the structure near

ery of steel in barges ready for lifting directly to final position was impractical because the easterly river span is over a flat sandy slope of the river bed that is normally dry and upon which a construction road had been built by the substructure contractor. A railroad siding and limited space, available immediately under the southwest approach, was utilized for delivery and storage. From this point, steel was raised by a 150-ton locomotive crane to cars on a material track on the south cantilever brackets of the bridge. These cars were then hauled out alongside the main traveler by a stationary engine that operated an endless hauling rope for movement either way.

Traveler of 100-ton capacity

The main traveler, which weighed 167 tons and had a capacity of 100 tons at 80 ft. forward and 20 ft. side reach, was designed for this particular job and was one of the largest of its type ever used on bridge construction. It traveled directly on the top flange of the main girders, which were spaced 40 ft. apart, and had a wheel base of 43 ft. 9 in. This longitudinal base dimension was increased, when lifting with a forward reach, to 61 ft. 3 in. between front blocking and rear tie-down. The 100-ft. boom had a topping lift reeved to 21 parts of 1-in. wire rope and main falls reeved to 14 parts of 1-in. rope.

The four all-steel falsework bents, including the piles, were erected with the main traveler. The piles, of 12-in.

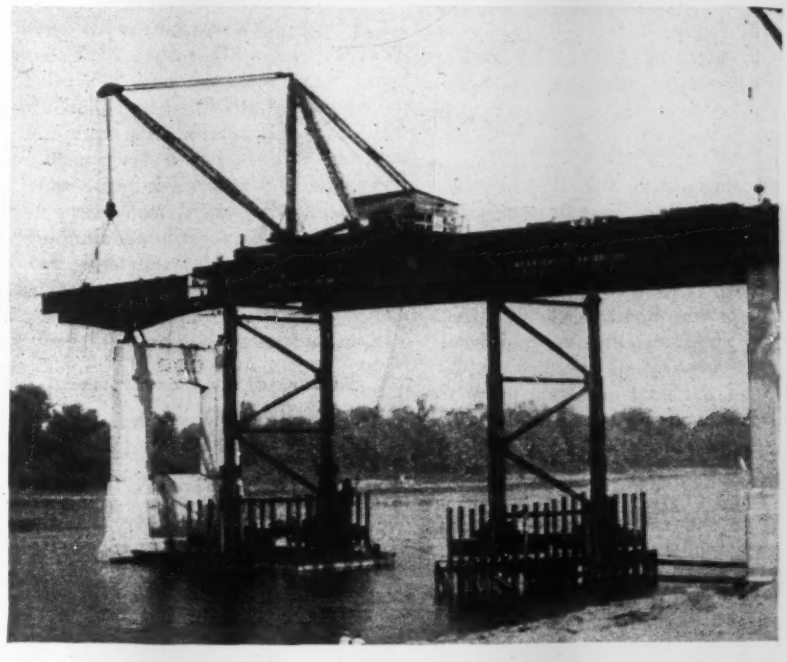


Fig. 1. Two falsework bents replace the single bent that was used in the unsuccessful first attempt at erection of the west 270-ft. span of the continuous girder. Split along a horizontal splice, the 17-ft. deep section over the left pier was erected in two pieces.

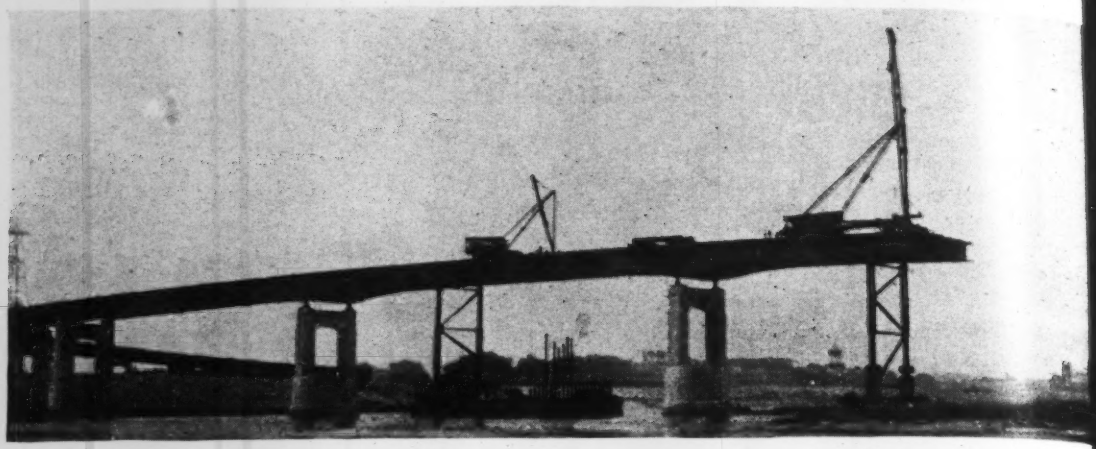


Fig. 2. The 840-ft. continuous-girder ready for the closing section of steel. The erection traveler weighed 167 t could handle 100 tons at 80 ft. ahead and 20 ft. to either side of the center.

88-lb. section and 75 ft. long, reinforced with plates and cast steel tips, were driven to refusal. Such refusal was undoubtedly rock as the number of blows for the last inch of penetration was within the range of 40 to 100 for the first bent. In subsequent bents, such excessive over-driving was not used as refusal was easily detected by sound of the hammer. In this latter work a few piles were selected for additional driving as a check, but no appreciable penetration could be obtained. The elevation of the river bottom varied from about Elev. —14 to —7 and the tip of piles were driven to Elev. —48 to —58 through some sand, the clay and a shallow layer of hardpan that overlies the bedrock.

Cage stabilizes falsework

The steel piles for the erection bents were driven through closely fitting guides in a 50-ton steel cage, which was 72 ft. long, 12 ft. wide and 13 ft. deep c. to c. of main members. This cage was floated into position, and the corner piles were driven. The cage was raised to permit withdrawal of the float and then lowered until it was about one-half submerged. In this position, it was secured to the corner piles and the remainder of the piles driven and bolted to the cage to make a very rigid type of bracing for the bent. There were two groups of 14 piles each in each bent, one group under each girder.

Above this cage, seven transverse beams were framed into the 14 piles in each group to support three tiers of grillages, which, in turn, supported one leg of the steel bent. The maximum direct load on the 28 piles in one of the bents, No. 2B, was 1,102 tons made up as follows:

Piles and fittings	128 tons
Cage	50 tons
Grillages	72 tons
Bent with jacks	102 tons
Superimposed load	750 tons
Total	1,102 tons

The resulting load of about 40 tons per pile did not produce any settlement other than a slight elastic compression.

Falsework bents No. 1A and No. 1B in Span 13 were re-used as bents No. 2A and No. 2B in Span 14. These bents were removed and the piles pulled by the auxiliary or follow-up traveler. The traveler was equipped with a 70-ft. boom, a topping lift reeved to 13 parts of $\frac{7}{8}$-in. wire rope and main falls reeved to 7 parts of $\frac{7}{8}$-in. rope and an estimated pull of 35 tons, held for a few moments, was sufficient to start a pile in all cases except three, where auxiliary jacking was also required.

Erection of the main girders

Each main river girder, 840-ft. long, was divided by vertical field splices into 8 sections varying in length from 78 to 126 ft. and in weight from 61 to 95 tons. The two haunched sections at Piers No. 13 and 14 were further divided by a horizontal field web splice near the center of each, to meet shipping clearances. It was originally intended, in both erection schemes, to rivet these two horizontal splices in the material yard and erect the girders in one piece. The erection failure o occurred when the traveler wa to lift the first of these assemb ders off the material cars. T ond erection scheme was modi the field, as an additional saf tor (principally for psycholog fect) by erecting these deep s in two pieces, the lower one we 49 tons and the upper part 4

The two falsework bents in 13 and 14 were in pairs, one fix the other provided with jacking and four 500-ton jacks. The bent in Span 15 was made a j bent. The fixed bents were predetermined elevations tha mitted erection of girder section zero moment at the field s These elevations were such th section was slightly above the t the bent when good holes we tained, and it was held in this tion until fitted up. The jacking were set in a similar manner i first section to be placed upon and then were jacked to anothe determined elevation for erecti next section of girder. This ja operation also served to free the bent and permit its removal and tion in the next span. Finall jacking bent was jacked down moved and rebuilt in the next

A typical girder section had or shingle splice with angles ex ing 10½ ft., and cover plates 12 beyond the center of the web s The splice material was readily scoped" a few feet by manipul the boom and falls of the tra A ¾-in. wire rope on an auxi drum of the traveler engine, re to 5 parts between sheave block

hed in the plane just above nge of the girder, was more le for the final "pulling to- closing of the splice. The ipment was also sufficient g the top section of the girder section into final even though the web of this s at the same time entered wo horizontal web splice its full length. (Fig. 4.)

Deck construction

the approach viaducts were land where temporary con- roads were available or constructed. Form lumber, g and concrete for one were delivered on the nd hoisted to the deck with ane. This crane maneuvered ll points on the approaches a total length of about 200 hand buggies were used to the concrete. The concrete second roadway was then th a road paver, operating viously completed roadway The deck concrete was vi- inished with a power oper- d, running on the steel curb and then wood floated and All approach roadways pleted before the spans over were started.

eel erector's schedule for the I-beam grid floor was for maximum speed and zation of the material track haul the steel out on the As a result, the scheduled placing the grid floor for the gth of 840 ft. in both road- so short as to preclude the se sequence of placing grid, d concrete. The sometimes of employing the thin steel s supplied with the grid for ete forms was not employed tead, as soon as the stringers were riveted, a complete deck form of $\frac{5}{8}$-in. plywood was laid ahead of the grid placed on 2x6-in. supports at 16-in. c. to c. This provided a working platform for the distribution and alignment of grid sections and permitted pouring of the slab immediately after the grid was welded in place. Such placement of forms in advance had one minor undesirable feature in that C-clamps could not be used to pull down the grid to contact with the steel framing for welding. This condition was overcome by using bolts, with their heads tack-welded to the steel framing, for aligning the grid. Comparatively few bolts were required as the outside edge of the individual 6x24-ft. sections could be pressed down with a pinch-bar with leverage on the curb, mall or adjacent sections of grid.

The concrete mix for the grid floor and sidewalks was 1,382 lb. of sand (including a 5-percent allowance for moisture); 1,480 lb. of $\frac{3}{4}$-in. crushed stone, 494 lb. of $\frac{1}{2}$-in. crushed stone and 7 bags of cement. It was mixed by a 1-cu.yd. capacity road paver operating on planks laid on the open grid floor. The mixer was serviced by two-batch trucks and the concrete placed by a truck crane with bottom-dump bucket, all operating directly upon the open-grid floor. The truck crane used outriggers, one resting on the center mall and the other upon the grid floor over a stringer. Both roadways were poured simultaneously, one being ahead of the other only by the reach of the truck crane, or about 50 ft.

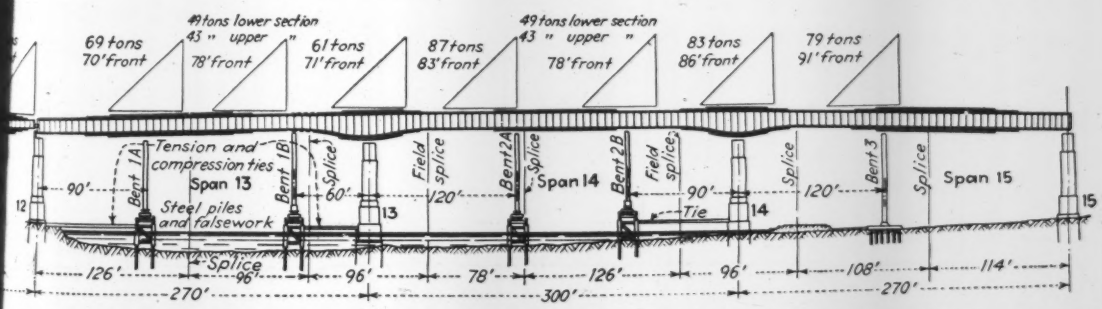
The power operated screed did not work successfully with the above described mix in the 6x6-in. openings of the grid. Better results were obtained by shoveling the batch to the approximate thickness; vibrating in alternate openings with the head of the flexible-shaft vibrator down on the form, and then hand screeding. Final finishing was with a 6-ft. float followed by semi-belting, which was accomplished by dragging a curing mat in the longitudinal direction only. The surface was finished flush with the top of grid beams except for a thin over-fill of mortar, which is expected to wear off under traffic. The under surface was likewise intended to be flush with the grid beams but the vibrating was sufficient to coat with mortar an estimated 95 percent of the bottoms of the grid beams.

The 840-ft. length of the grid floor in the dual roadways was poured in three and one-half working days. Sidewalk slabs were poured after all roadways had been completed. Truck-mixed concrete was used for the sidewalk, the trucks hauling out on structure and chuting concrete directly into place.

Very minor variations in steel

The degree of accuracy with which a structure of this type and magnitude can be fabricated and erected is believed to be of interest. A survey of the roadway profile was made after the full dead load was on the structure; readings were taken on top of the finished roadway at each curb and each side of the center mall for each panel point. The weight of the unpoured sidewalks was fully compensated for by the weight of the roadway and the sidewalk forms then in place. For readings taken adjacent to the center mall, the maximum variation from the specified profile was minus 1 in. for Span 13, minus $\frac{15}{16}$ in. for Span 14 and plus $\frac{11}{16}$ in. for Span 15. For all transverse sections, the maximum variation in elevations of points at the north and south curb (in a width of 52 ft.) was $\frac{5}{8}$-in.

Construction was commenced Sept. 30, 1940, erection of superstructure



...o bents of falsework were used in the first 270-ft. span and moved ahead into the center 300-ft. span. One of ... moved into the third span, 270 ft. long, to complete the erection of the long continuous girder.

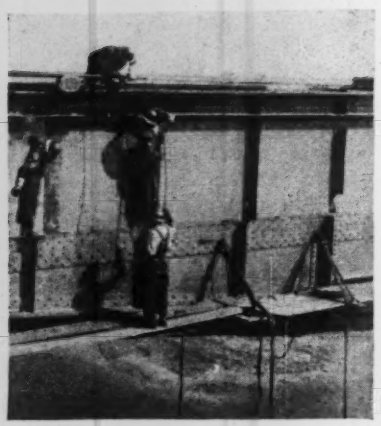


Fig. 4. Close-up of joining the horizontal splice of Fig. 1. A 5-part line pulls the top section to closure.

Fig. 5. Concrete for filling the grid deck was mixed by paver and distribu a bottom-dump bucket handled by a truck-mounted crane. All equipment t directly on the grid.

started in July, 1941, and the bridge was dedicated and opened to traffic Sept. 5, 1942. The first section of the main river spans was erected on May 18, 1942 and the last section on July 28, 1942.

Prior to May 28, 1942, the construction was supervised by the Connecticut State Highway Department. A. W. Bushell, now deputy commissioner, M. A. Tyack, engineer of contracts, and L. J. Conaty, project engineer were in charge.

Subsequently, the firm of Robinson & Steinman were retained to supervise the field work with H. D. Robinson as resident consulting engineer and the writer as resident engineer.

The foundations were constructed by The A. I. Savin Construction Co., Hartford, Conn., under a $ contract. B. Wilder served as intendent. The superstructur fabricated and erected by The ican Bridge Co., for whom t W. James Ward and D. Murray were successively superinte The bid price was $1,236,9 including the lighting or t facilities.

Cross-Connection Hazards From Refrigerating Equipment

Cross-connections between water mains and sewer systems as a result of improper installation of refrigeration machines have been found to be the cause of contamination of water supplies in Chelan County, Wash. This was revealed in the February issue of *Water Supply and Sewerage News*, published by the division of public health engineering of the state health department, in a report by Lloyd C. Ajax, general sanitarian of the Chelan County health department.

Reports Mr. Ajax: In trying to find how contamination entered the mains of a town in our county at the time the water was turned off, our attention was drawn to refrigeration equipment in the town. Here, we found three refrigerators having water-cooled condensers where the city water supply passed through the condenser and then entered directly into a public sewer system. Apparently this was the cause of the contamination — the water draining from the mains at the time of a cut-off created a negative pressure which pulled sewage from a horizontal soil pipe or a flushed toilet through the building's water system and out into the water mains.

After this discovery, we made a survey of every grocery, dairy, meat market, beer parlor, fountain, apartment house and restaurant in the county, checking refrigerators. The water superintendent or plumbing inspector in each town worked with us on this. To date, we have found 32 refrigeration machines forming a direct connection between the water and sewerage systems, and we have a few more to check. We have found approximately 50 percent of the water-cooled machines directly connected to a sewer.

Of course, this type of connection is against basic plumbing rules and is prohibited by rules and regulations governing food-handling establishments, but the majority of these connections have been made by refrigerator men or handy men not aware of the danger involved. A few were installed by plumbers. In some ca original installation was corre the owner changed the connec eliminate noise or overflow clogged open fixture.

We are receiving very fine co tion from owners of establishm eliminating these direct connec When the danger is explained owner, and he is shown how h run this condenser water i trapped open fixture, he is u anxious to comply with our req have it changed. Besides, many ers of refrigerators are finding can save water by knowing how is going through their machi was very easy to convince one of the danger when it was de strated to him that his refrig was not operating efficiently be the condenser was clogged with age.

If the health departments, superintendents or plumbing in tors in each community will these refrigerator connections eliminate all direct connections effort will be repaid by less bad ples and a safer water supply, cludes Mr. Ajax.

From Field and Office

NG PROBLEMS AND TIME-SAVING METHODS FOR ENGINEERS AND CONTRACTORS

cal Curve Elevations

mes, when giving grades nstruction, the elevation of ation is needed if the plans y elevations for the even d 50-ft stations. Rather than h all the work of figuring nt elevation and then mak- correction for the vertical e following method is sug-

e calculations let:

ebraic difference of grades in ercent;
gth of vertical curve in stations;
tance from P.V.I. to curve;
ord length;
rrection factor to be applied to verage elevation.

verage radius, R, of the ver- ve will be,

$$\frac{L^2 \times 100^2}{8} = \frac{L^2 \times 100^2}{8 \times \frac{A\,L}{8}} = \frac{L \times 100^2}{A},$$

correction factor will be,

$$\frac{C^2}{\frac{8L \times 100^2}{A}} = \frac{C^2 A}{8L \times 100^2}.$$

it is desired to find the ele- f a +25 or a +75 station on ical curve and the elevations n only at the 100-ft. and plus ations, it is only necessary to the given elevations and ap- correction factor. The correc- plus if the curve is a spur and f it is a sag.

+25-ft. or a +75-ft. station, ft. and $K = \frac{50^2 A}{8L \times 100^2} = \frac{A}{32L}$.

the algebraic difference of des, divided by 32 times the of vertical curve gives the to be added to or subtracted e average given elevations. As mple, assume a 300-ft. vertical ith —2.60 and +2.60 percent has an elevation of 61.01 at 415+0 and an elevation of t station 415+50. Wanted is ation of Station 415+25. Thus, $\frac{59.93}{} = 60.47$ and the correction

=.05.

e the curve is a sag, the cor- must be subtracted or 60.47— 60.42, which is the required elevation for station 415+25. Once this correction factor has been determined it holds good throughout the curve and any +25-ft. or +75-ft. elevation can be easily found. Of course the formula is true for any chord length.

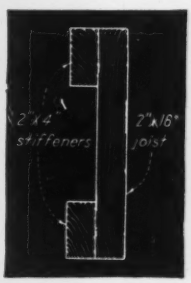
If only the even 100-ft. stations were given, it would be possible to average them and apply the correction, $K = \frac{A}{8L}$; the correction for 12.5-ft. intervals would be $K = \frac{A}{128L}$.—*Charles G. Curry, New Jersey State Highway Department, Plainfield, N. J.*

Field and Office Comment

Strengthening Floor Joists

Sir: In *Engineering News-Record* Dec. 3, 1942, p. 797, there is an article "Truss-Braces on Joists Steady 22-ft. Spans." I believe that this method of bracing is based on a fallacy. So that younger engineers just starting in the profession will not blindly copy this design, a complete analysis of this method is given.

The stiffening action is based on the presumption that the 2 x 10-in. braces exert an arching action, because the ends abut at the middle of the span and the braces are notched into the 1 x 3-in. boards on the 2 x 6-in. plates. But wood shrinks when it drys, so close contact at the center is lost. It is stated in the article that kiln-dried lumber was used, but with this lumber, dried to a moisture content of 7 percent, about one quarter of the total shrinkage possible can still occur. When the timber shrinks, considerable deflection must occur before the ends of the braces meet again, this bending being sufficient to cause failure in many instances.



A small timber top and bottom strengthens a floor joist.

However, assuming that the arch action can take place, and the nails do not split the braces, the reinforcement is not effective. To have effective arch action, substantial abutments must be provided. To have no substantial abutments, as in this case where only the beding of the stud would resist this thrust, a tierod is necessary to tie the ends together to take the thrust.

Since there is no tierod, it is evident that the lower part of the joist will have to act as a tie. These lower fibers are already highly stressed in tension from beam action. To increase this tension by adding to it that required to take the thrust from the diagonal braces is not helpful. This old time method of attempting to stiffen a beam is therefore based on a fallacy and should never be used in building work.

The writer feels that if a deeper joist were used, a stiffer and better job would have been obtained with less material. If it were impossible to use a deeper joist, due to head room or other reasons, a stiffer and stronger beam could be obtained by using a wider joist or by spiking a 2 x 4-in. timber along the top and bottom of the 2 x 16-in. joist as shown.—*Theodore B. Rights, Civil Engineer, Roselle, N. J.*

More on Square Root Short Cuts

Sir—Any presentation of a mathematical process involving an approximate result is incomplete without disclosure of the upper bound of error. Hence, it may be helpful to readers who use Mr. Boardman's process of approximating a square foot (*ENR*, Jan. 28, 1943, p. 149) to know that the root so obtained cannot be depended upon to more than twice the significant figures that are correctly given in the first approximation.

This is clearly shown in Dr. L. J. Comrie's Introduction to Barlow's Tables (1935 edition) which outlines the identical process, except that his

first approximation is presumed to be obtained from tables instead of from a slide rule.

For the range above 3, it is difficult to read an approximate root from a slide rule with certainty in the third figure. The sixth figure of the second approximate root is thus uncertain, which substantially limits the process to about five-figure accuracy. This conclusion is inescapable despite certain examples which may show greater accuracy.

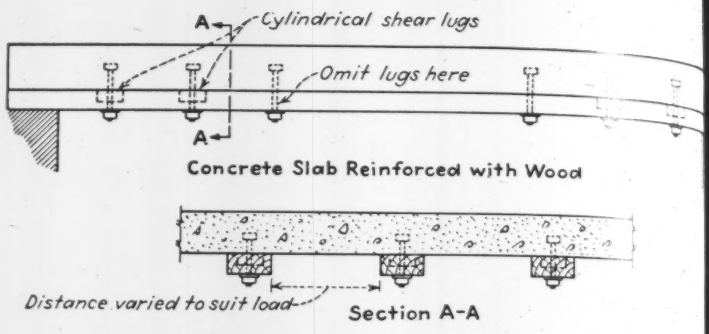
H. T. Avery, who introduced the "nearest number" process (*ENR*, July 16, 1942, p. 81), by aid of a short table of pre-calculated double square roots of numbers that are close to the values whose roots are desired, eliminated need of obtaining the final "mean value" as required by Mr. Boardman's (and Comrie's) process. The root to five figures becomes, then, $(N+A)/B$, in which N is number whose root is desired, A and B are taken from table as three and seven digits respectively. A continuous three-step calculating machine operation solves this expression.—*Tracy W. Simpson, Marchant Calculating Machine Co., Oakland, Calif.*

Concrete Reinforced with Timber

Sir: I have recently made tests on concrete slabs reinforced with wood tension members; the results were encouraging. The purpose was to determine the practicability of replacing steel reinforcing under certain conditions, such as the present scarcity of reinforcing steel.

The accompanying sketch shows the method of combining the materials. The 2x4's were bored on the flat side with an expansion bit so as to form depressions of 2-in. diameter and 1 in. deep. Concentric with these, holes for ½ in. bolts were bored. The concrete filling the depressions forms lugs to supply the bond and resist the horizontal shear. The lugs are omitted at points of maximum moment and minimum shear. The principal function of the bolts is to hold the parts in contact. Where the span is too great for a simple slab, a T-beam with wood reinforcement could be used.

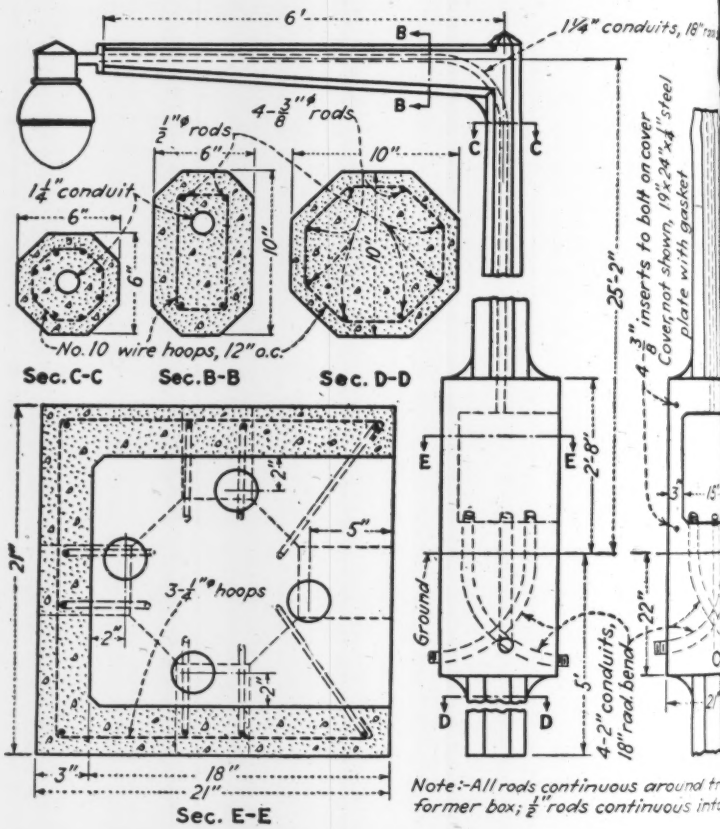
Some of the advantages of this combination are: (1) wood is more readily obtainable than steel at the present time; (2) comparing the materials on the basis of tensile strength, wood costs about half as much as steel; (3) wood members used for tensile reinforcement replace part of the form lumber; and (4) the wood furnishes a ready means of attachment for a ceiling, insulating material, etc.



Concrete slab reinforced with timber showed four important advantages for type of reinforcing.

This type of slab could be used for flat roofs and floors of moder... pacity. Gravel, broken stone, o... weight aggregates could be em... Where cinders are available, ... might be a field for its use ... structing flat roofs and ... dwellings.—*Alfred Boyd, pr... of civil engineering, Univers... North Dakota, Grand Forks, ...*

Precast Concrete for Lighting Standards



To save steel, a large number of lighting standards at a Navy shore establis... were built of precast concrete. Details of the design, pictured herewith, sho... various shaped sections, the reinforcement and arrangement of wiring.

PROTECTED

FROM EVERY ANGLE!

LOOK OUT, you Axis aviators! This bomber is a hornet with a sting on every side . . . protected from attack by blistering fire poured to all points of the compass.

Protection is also important here at home. Guard your equipment and tools to save vital metals . . . cut down needless waste and we can produce more war materials. Storage batteries, for example, last longer when you follow these four simple rules. Obey them all now and you're hitting the Axis. *Buy to Last and Save to Win!*

Exide
BATTERIES
FOR CRANKING
DIESEL ENGINES

THE ELECTRIC STORAGE BATTERY CO., Philadelphia
The World's Largest Manufacturers of Storage Batteries for Every Purpose
Exide Batteries of Canada, Limited, Toronto

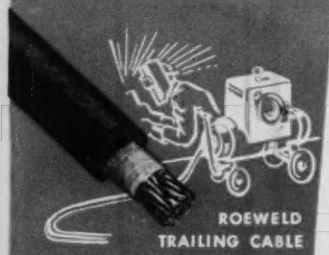
PROTECT YOUR BATTERIES FROM THESE FOUR ANGLES:

1. Keep adding approved water at regular intervals. Most local water is safe. Ask us if yours is safe.
2. Keep the top of the battery and battery container clean and dry at all times. This will assure maximum protection of the inner parts.
3. Keep the battery fully charged—but avoid excessive over-charge. A storage battery will last longer when charged at its proper voltage.
4. Record water additions, voltage, and gravity readings. Don't trust your memory. Write down a complete record of your battery's life history. Compare readings.

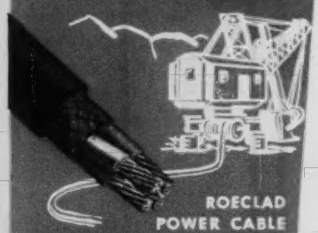
If you wish more detailed information, or have a special battery maintenance problem, don't hesitate to write to Exide. We want you to get the long-life built into every Exide Battery. Ask for booklet Form 2399.

ROEBLING

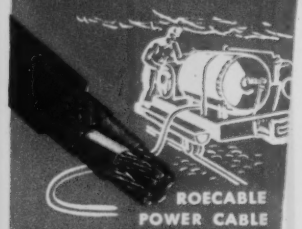
Portable CORDS and CABLES



ROEWELD TRAILING CABLE



ROECLAD POWER CABLE



ROECABLE POWER CABLE

ROEBLING FLEXIBLE CORDS

ROESHEATH PARKWAY CABLE

TOUGH? you Bet! but Uncle Sam says...

"TREAT 'EM CAREFULLY!"

1 REPAIR DAMAGES PROMPTLY

To repair a bruised cable jacket, cut away damaged insulation and taper or "pencil" back on each side to four or five times the thickness of insulation. Clean and apply insulating cement to taper and conductor. Wrap splicing tape to same thickness as original jacket. Patch vulcanize—but if this is not practical, apply tape to 2 inches beyond repair and finish as for splice, as explained below.

2 PIECE TOGETHER SHORT LENGTHS

To splice short cable lengths, cut back jacket and insulation from each end. Clean and splice the conductors. Taper or "pencil" back as for repair, to four or five times insulation thickness. Wrap splicing tape to same thickness as original jacket if patch vulcanizing is possible. If not apply friction tape overall, half-lapped to 2 inches beyond splice and finish with a waterproof paint.

JOHN A. ROEBLING'S SONS COMPANY

TRENTON, NEW JERSEY — Branches and Warehouses in Principal Cities

NEWS OF THE WEEK

(*Continued from p. 57...*)

Army engineers demolis... bridges in North Caroli...

Army engineers of the 303rd Batta... of the 78th Division, now training... Camp Butner, N. C., in cooperation ... W. L. Craven, bridge engineer of ... North Carolina Highway and Pu... Works Commission, have obtained ... mission to, and now are demolishi... number of abandoned bridges in ... state.

"Besides giving the men valuable ... molition experience that will serve t... well in actual combat, and which c... not have been received in any o... manner," said Lieut. Col. E. M. M... ham, Jr., who is in command of ... regiment, "the demolition serves ano... valuable purpose—it provides scrap ... for war industries, releases con... fragments that can be used for re... ment work and other concrete that ... be crushed and used for road bas... By working with the contractor, ... army engineers are able to reduce ... demolition time and thus speed the ... essary materials to more productive ...

• • •

War housing construct... being stepped up

More than 50,000 government-finan... housing units for war workers w... placed under construction during Ja... ary, which was three times the aver... monthly rate of construction initiated ... ing the fourth quarter of 1942, as a... nounced by Commissioner Herbert E... merich of the Federal Public Hous... Authority.

It is claimed that measures taken ... speed up pre-construction operations ... facilitate the flow of critical mater... have been largely responsible for st... ping up the rate of activity of the ... housing program.

By January 31, a total of 246... publicly-financed dwelling units for ... workers had been completed since ... start of the war housing emergency ... the summer of 1940. Another 225... units are now under construction a... nearly 120,000 units are scheduled ... of the funds currently available to m... housing requirements resulting from ... migration of war workers through Jul... of this year. Of the units completed ... the end of January, 181,755 represent ... accommodations for families in p... structures, 49,913 were dormitory un... and 14,846 were trailers.

The Federal Public Housing Author...

a jungle gets a "Shave"!

ker Hydraulic Bulldozers the "Barbering"

ntractors and road builders who have loted Bakers through piney woods and rests would get a kick out of the way t-skinners in uniform are using them clear patches of jungles that are as ngled as spaghetti, sloshing through angrove swamps that were yesterday ought impenetrable.

hen the peace treaties are signed and big post-war rebuilding job gets derway, ask the vets who saw the mazing job Bakers did—ask the boys ho ran them what they think of *direct ydraulic lift and full down pressure on e blade*—of Baker's fast, positive ac-on and ease of maintenance. Then, ou'll want Bakers, too!

THE BAKER MFG. CO.

"If it concerns Victory, it concerns us"

567 Stanford Avenue
Springfield, Illinois

News from "Down Under"

War Correspondent: "This isn't like the Spanish-American War, is it?"

Army Engineer: "Hell, no! Malaria, typhoid and dengue were our worst enemies then, I believe."

W.C.: "This war seems more than a matter of fighters and guns. I notice a lot of construction machinery in use in this neck of the woods."

A.E.: "Yes, this war tops all others when it comes to the use of equipment such as you see along highways and around building projects all over the States in peace-time. Take those bulldozers over there — it'd be tough goin' without those babies—not only here, but on all our fronts."

W.C.: "I suppose it would be a tough job carving landing fields and roads out of that dense tropical growth without those rigs?"

A.E.: "Tough job? It would be practically impossible! You see, those dozers bowl over trees, tear out matted bougainvillaea, grub out roots that would quickly start growing again if you didn't eradicate them, fill up the holes that are left and level smooth as a pool table, ready for surfacing—do it single-handed."

W.C.: "How do the Nips do it?"

A.E.: "Mainly with 'rice burners,' using picks and shovels. These bulldozers are our ace in the hole. When Nip captives see how we do it, they lose their superiority complex, but pronto."

(Based on a news story, "Yank Engineers 'Lift' Faces of South Sea Isles," by E. R. Noderer, Chicago Tribune ace war correspondent.

BAKER

The Modern Tractor Equipment Line for
EARTH MOVING
LEVELING AND GRADE BUILDING
SNOW REMOVAL
ROAD MAINTENANCE

HELPFUL INFORMATION ON

REZNOR UNIT HEATERS . . .

Send for your copy

Reznor has manufactured gas heating equipment exclusively since 1888. This solid foundation of long and broad experience enabled the company to develop and build outstanding features in its gas fired unit heaters. Reznor Units are available in 3 types and 9 sizes. No other type of equipment can be installed as quickly, and at the same time, 89% of vital materials is saved. Reznor Gas Fired Heaters also move more warm air over wider areas. Catalog U 42 tells with descriptive pictures and words how and why Reznor equipment will operate to advantage for you.

Send for your copy today.

REZNOR MANUFACTURING CO.
105 James St., Mercer, Penna.

"GAS HEATERS EXCLUSIVELY SINCE 1888"

is currently responsible for a major share of all war housing construction financed by public funds.

• • •

Definition of maintenance and repair revised by WPB

What constitutes maintenance and repair of a building is set forth in a revised definition contained in an amendment to Conservation Order L-41, issued by WPB.

The new definition specifically designates that where a single job is partly maintenance and repair and partly new construction, the whole project will be considered new construction and subject to Order L-41.

In addition, the amendment reduces to $200 new construction which may be undertaken, without specific authority, by a number of manufacturing enterprises which are not essential to the war program. Moreover, the amendment applies to private dwellings and commercial structures.

Order L-41 is a limitation order which is designed to prevent unnecessary construction in order to conserve materials, facilities and labor for essential war uses. Under the new definition, maintenance and repair actually means work that is necessay to keep a structure in sound condition, but does not include any building operation involving a structural alteration or change in design.

• • •

Big New York aluminum plant ready for work

The largest aluminum producing plant in the United States to be built with government funds under the war emergency program of the Defense Plant Corporation began operation in about 25 percent of its units recently in Maspeth, Queens, New York City.

Mayor F. H. LaGuardia announced start of production in a radio address. Officials of the Aluminum Co. of America, which operates the plant for the government, said that it will be several months before the factory is in full capacity production.

The mayor revealed that there are 33 buildings in the project, all erected during the past year. The plant will confine itself solely to the reduction process in the production of aluminum.

• • •

S.C. abolishes traffic engineering branch

The traffic engineering division of the South Carolina State Highway Department has been abolished for the period

(*Continued on page* 106)

Here Is Your Nearest Worthington Distributor

For Sales, Rental and Service on BLUE BRUTE Portable Compressors, Rock Drills and Air Tools. Get your EQUIPMENT-SAVER — FREE

see full page ad page 101

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CALIFORNIA
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Harrisburg — N. A. Coulter
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Philadelphia — Metalweld, Inc.
Pittsburgh — John McC. Latimer Company
Wilkes-Barre — Ensminger & Company
SOUTH CAROLINA
Columbia — Bell-Lott Road Machinery Co.
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TEXAS — Dallas — Shaw Equipment Company
Houston — McCall Tractor & Equipment Co.
San Antonio — Patten Machinery Company
VIRGINIA
Richmond — Highway Machinery & Supply Co.
WASHINGTON
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WYOMING
Cheyenne — Wilson Equipment & Supply Co.

Get more WORTH from air with WORTHINGTON

Buy Blue Brutes

Worthington Pump and Machinery Corp.

A GOOD MAN WITH BRUTES

uy 'em, rent 'em, get 'em fixed... he's ood man to depend on when you're jam or want to *keep out* of one. 's the Worthington distributor, the who handles Blue Brutes — com- sors, rock drills, air tools.

f you need a Blue Brute — or several *last* . . . he'll do his darndest to get it ou as soon as possible after you hang your phone. If your Blue Brutes are g a stiff schedule, he's the man to them to for a "physical" — a wise caution these days when replacements are hard to get. If rough treatment has turned up bruises or breaks, he's got a "first aid kit" of supply parts and repair "know-how" that will restore their pep and vigor.

They make quite a team. Rugged, easy-breathing Blue Brute Air Compressors with the improved and famous "Feather* Valve" . . . easy-handling Blue Brute Rock Drills and Air Tools for a wide range of work . . . and capable, cooperative Blue Brute Distributors whose job is helping you get *your* job done.

Behind the Fighting Fronts with

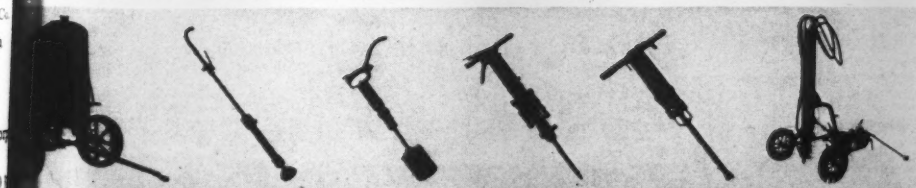
BLUE BRUTES

Blue Brutes on the Alaskan highway help punch through the vital life line that will help the U. S. Army smash the Japs! In addition, Blue Brutes are at work today on hundreds of Army, Navy and Air Force projects all over the country —in "uniforms" of olive drab and battleship gray, instead of customary blue.‡ Your nearest distributor is listed on page 100.

*. U. S. Pat.
‡ Brute Compressors and Air Tools are painted olive drab for the Army and battleship gray for the Navy.

Get more WORTH from air with WORTHINGTON

BUY BLUE BRUTES



sors from 60 to 500 cu. ft. capacity in mount- uit all jobs. Rock Drills and Air Tools that have always set the pace for easy operation — available in a wide range of weights and sizes.

WORTHINGTON

Worthington Pump and Machinery Corporation, Harrison, N. J. Holyoke Compressor and Air Tool Department, Holyoke, Massachusetts

CONTRACT UNIT PRICES

What contractors are bidding on different kinds of construction work

RAISING ROSS DAM—SEATTLE, WASHINGTON

OWNER: City of Seattle, Department of Lighting, E. R. Hoffman, superintendent.

PROJECT: Clearing portion of Ruby Basin, and constructing second step of Ross Dam (concrete arch dam) across Skagit River in Whatcom County, Washington. Existing structure (first step) consists of twelve sections, each approximately 50-ft. long. Two end sections are complete to El. 1300, and ten center sections to El. 1365, forming a gravity dam sealed against abutments at either end with concrete wing walls upstream from permanent dam face. Dam surmounted by timber crib 15-ft. high. Crest of timber crib is at El. 1380.15; overflow spillway length is 455 ft. Under this contract, abutments to be excavated and end sections completed to El. 1385, after which timber crib is to be removed. Contractor is then to raise entire dam at uniform rate, keeping alternate sections high, with no section to be more than 20-ft. higher than adjoining section.

CONDITIONS: City of Seattle intends to impound water behind Ross Dam as soon as construction and the strength of new concrete permits. River is subject to extreme floods, and the demand for power fluctuates. Superintendent of Lighting reserves right to designate time when 72-in. pipes and concrete plug in diversion tunnel is to be installed, and time when Ruby Lake is to be lowered to permit installation of gates, outlet pipes and trash rack. Highway transportation facilities are available, and the city's Skagit River Railroad makes connections with Great Northern at Rockport. Priority rating of project is AA-2X. Time for completion is 555 calendar days. Owner is to furnish 72-in. steel pipe; manhole rings and covers; cable for strain meters (3 and 4 conductor); companion halves to grout outlets already installed. Spec wage rate minimums are: skilled labor, $1.30 to $2.00 hour; semi-skilled, $1.10 to $1.55; common, $1.015 to $1.

BIDS: Bids were originally asked for June 11, 1942. That ing was postponed until June 18, and then postponed definitely. Later, August 6th was set as the bid date. A 6th bids for the raising of the dam, for cement, and for charge regulating valves, each separately, were rejected this opening the low bid for the dam construction was $6,214; for cement $927,676; and for regulating valves $5 Three bids were received on the January 21, 1943 ope ranging from the contract low of $7,144,923 to $10,01 This opening included raising of the dam, cement, valves in addition, the plant for cooling concrete, and resis thermometers, wire strain meters, and wire joint meters.

LIST OF BIDDERS: (August 6, 1942 opening. All bids rejected)

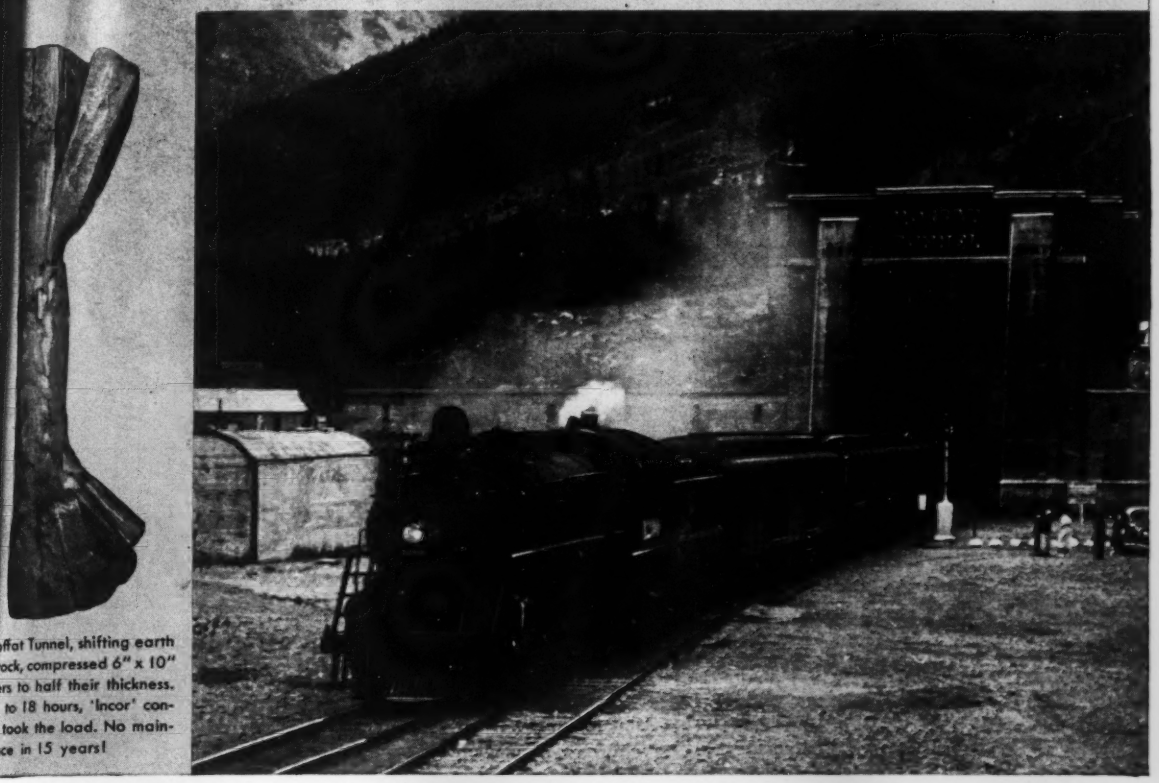
1a. General Constr. Co., J. F. Shea Co., Inc., and Morrison-Knudsen Co., Inc., Seattle Wash., (raising dam) $6,1
1b. Superior Portland Cement, Inc., Seattle, Wash. (cement) 9
1c. S. Morgan Smith Co., York, Pa. (valves) 5

LIST OF BIDDERS: (January 21, 1943 opening)

1. General Constr. Co., J. F. Shea Co., Inc., and Morrison-Knudsen Co., Inc., Seattle, Wash. (contract) $7,1
2. Guy F. Atkinson Co., San Francisco, Calif. 8,0
3. S. A. Healy Co., White Plains, N. Y. 10,0

	January 21, 1943 — Basis on which award was made					August 6, 1942* — Bid rejected	
			Unit Prices				Unit Price
	Item	Quan.	(1)	(2)	(3)	Quan.	(1)
1.	Rock excavation	113,000 c. y.	$8.00	$8.80	$11.00	94,000 c. y.	$9.0
2.	Drill 4-in. vertical vent hole	170 l. f.	15.00	14.00	12.50	Unchanged	Unchange
3.	Remove timber crib and end walls	Lump Sum	15,000.00	10,000.00	15,000.00	"	"
4.	Drill 1½-in. grout holes, to 30-ft	8,000 l. f.	3.50	2.75	3.00	"	"
5.	Drill 1½-in. grout holes, 30–50 ft	2,500 l. f.	3.50	2.75	3.00	"	"
6.	As above, 50 to 100 ft	1,000 l. f.	3.50	2.75	3.00	"	"
7.	As above, 100 to 150 ft	5,000 l. f.	3.50	2.75	3.00	"	"
8.	As above, 150 to 500 ft	6,000 l. f.	4.50	4.00	4.00	"	"
9.	Pressure grouting of foundation	5,000 c. f.	3.00	2.50	2.75	4,500 l. f.	4.00
10.	Drill drainage holes, to 50 ft	2,000 l. f.	4.50	5.00	4.00	Unchanged	Unchange
11.	Drill drainage holes, 50 to 100 ft	1,500 l. f.	4.50	5.00	4.00	"	"
12.	Drill drainage holes, 100 to 150 ft	1,500 l. f.	4.50	5.00	4.00	"	"
13.	Furn. and install 1¼-in. black welded steel pipe for foundn. grouting	2,000 l. f.	.75	.60	.75	"	"
14.	As above, 2-in. pipe	3,500 l. f.	1.00	.75	1.00	"	"
15.	Furn. and install 4-in. black welded steel pipe for foundn. drainage	1,600 l. f.	2.00	2.10	2.00	"	"
16.	Furn. and inst. 8-in. porous conc. tile drain	15,400 l. f.	2.00	1.90	2.00	"	"
17.	Furn. and inst. 20-in. split porous conc. tile drain	3,850 l. f.	6.00	5.75	6.00	"	"
18.	Copper water seals, 15-in. wide, upstream face of dam	5,600 l. f.	3.00	2.50	3.75	"	"
19.	Galv. iron grout stops, vertical and horizontal, 15-in. wide	12,000 l. f.	1.50	1.40	2.10	"	"
20.	¼-in. std. black pipe for grouting contraction joints	25,000 l. f.	.50	.45	.50	"	"
21.	As above, 1¼-in. pipe	11,000 l. f.	.80	.75	.75	"	"
22.	Grouting units, black, complete	2,500 ea.	3.00	2.50	3.50	"	"
23.	Reinforcing steel	750,000 lb.	.08	.09	.08	750,000 lb.	.09
24.	Black electrical metal conduit, to 1½-in., incl. bends and elbows; hot dipped in asphalt	5,800 l. f.	1.00	.90	.75	Unchanged	Unchange
25.	As above, 1½-in. to 3-in	4,650 l. f.	2.00	2.00	1.20	"	"
26.	As above, 3½-in. diameter	1,000 l. f.	3.00	2.75	2.00	"	"
27.	Elect. metal panel and pull boxes, over 10½-in. in longest dimension	1,000 lb.	1.00	1.25	1.00	"	"
28.	Electrical wiring, to No. 12 A. W. G	7,000 l. f.	.15	.12	.15	"	"
29.	As above, No. 12 to No. 8 A. W. G	1,500 l. f.	.30	.25	.20	"	"
30.	Stranded elect. wiring, No. 8 to No. 00 A. W. G	3,080 l. f.	.50	.45	.50	"	"
31.	Furn., fabricate and install cables for resistance thermometers, strain meters and joint meters	40,000 l. f.	.35	.35	.50	40,000 l. f.	.40
32.	Furn. electr. resistance thermometers	14 ea.	15.00	6.00	10.00	Not required in Aug. 6 opening	
33.	Furn. elastic wire strain meters	255 ea.	30.00	25.00	40.00	Not required in Aug. 6 opening	
34.	Furn. elastic wire joint meters	16 ea.	30.00	27.50	40.00	Not required in Aug. 6 opening	

ARKING THE 15TH ANNIVERSARY OF A NEW ERA IN CONCRETE CONSTRUCTION



offat Tunnel, shifting earth rock, compressed 6" x 10" ers to half their thickness. to 18 hours, 'Incor' con- took the load. No main- nce in 15 years!

MANY HAPPY RETURNS!

FIFTEEN YEARS AGO, Moffat Tunnel was being driven through the Rockies. Trouble loomed ahead when the famous Rock Creek fault was reached. Terrific pressures from shifting earth and rock compressed 6 x 10 in. timbers to half their thickness. Ordinary concrete did not gain strength fast enough—so 'Incor' 24-Hour Cement, then undergoing final field tests by Lone Star Cement engineers, was used. In 12 to 18 hours, forms were removed. 'Incor' held back the sagging mountain. Proof aplenty of dependable high early strength.

Chapter 2—Ultimate Strength and Durability: Here, too, the record speaks for itself. For 15 years, 'Incor' has held in check the greatest pressures ever encountered in rock-tunnel work. A wire just received from the Tunnel Commission reads: "CONDITION OF 'INCOR' CONCRETE IN MOFFAT TUNNEL EXCELLENT—HIGHLY SATISFACTORY."

This telegram marks the fifteenth anniversary of a new era in concrete construction—in which speed and durability are successfully combined by 'Incor,' America's FIRST high early strength Portland cement. Continuing research keeps Lone Star Cement and 'Incor'* at the forefront of quality. Result: Initial construction economies—plus long-time service which spells "many happy returns" through the years. *Reg. U. S. Pat. Off.

LONE STAR CEMENT CORPORATION

Offices: ALBANY • BIRMINGHAM • BOSTON • CHICAGO • DALLAS • HOUSTON • INDIANAPOLIS • JACKSON, MISS.
KANSAS CITY • NEW ORLEANS • NEW YORK • NORFOLK • PHILADELPHIA • ST. LOUIS • WASHINGTON, D. C.

ONE STAR CEMENT, WITH ITS SUBSIDIARIES, IS ONE OF THE WORLD'S LARGEST CEMENT PRODUCERS: 15 MODERN MILLS, 25-MILLION BARRELS ANNUAL CAPACITY

Item	Quan.	January 21, 1943 — Basis on which award was made: Unit Prices (1)	(2)	(3)	August 6, 1942 — Bid rejected: Quan.	Unit Prices
35. 1½-in. black welded pipe railing, double rail	260 l. f.	5.00	4.00	4.00	Unchanged	Unchanged
36. Extension of gaging well	Lump. Sum	9,000.00	1,000.00	6,353.52		
37. Roughen surface of existing dam	64,500 s. f.	.60	.75	.50	"	"
38. Cement — EA-C 150 Type II (bulk)	470,000 bbl.	2.60	2.85	3.25	Bid separately in Aug. 6	
39. Cement — EA-C 150 Type II (cloth sack)	1,000 bbl.	3.00	3.60	3.50	Bid separately in Aug. 6	
40. Cement — EA-C 150 Type II (paper bag)	3,000 bbl.	3.20	3.40	3.30	Bid separately in Aug. 6	
41. Cement – EA-C 150 Type II (Hyurly—paper bag)	3,500 bbl.	4.00	3.90	4.00	Bid separately in Aug. 6	
42. Concrete, Class A	290,000 c. y.	8.87	10.65	14.00	264,000 c. y.	11.50
43. Concrete, Class B	124,000 c. y.	8.87	10.65	14.00	113,000 c. y.	11.50
44. Concrete cooling pumping plant	Lump Sum	50,000.00	25,000.00	90,100.00	Not required in Aug. 6	
45. Electrical energy used for pumping cooling water	1,500,000 kw. hr.	.04	.01	.02	Not required in Aug. 6	
46. Metal tubing and fittings for conc. cooling system	340,000 lb.	.25	.27	.21	Not required in Aug. 6	
47. Rein. concrete in valve house, Cl. C	125 c. y.	40.00	50.00	45.00	Unchanged	Unchanged
48. As above, Class D	125 c. y.	40.00	50.00	45.00	"	"
49. Cl. D rein. conc. in stairway shaft and shaft house	180 c. y.	40.00	81.00	45.00	"	"
50. Furn., install circular stairway	60 treads	10.00	15.00	25.00	"	"
51. Cl. C rein. conc. other than in valve houses	100 c. y.	30.00	40.00	30.00	"	"
52. As above, Class D	350 c. y.	30.00	40.00	30.00	"	"
53. Rein. conc. in spillway training walls	3,000 c. y.	40.00	30.00	25.00	"	"
54. Concrete, Class E	50 c. y.	40.00	16.00	50.00	"	"
55. 48-in. electrically welded steel pipe	83,500 lb.	.25	.25	.20	"	"
56. 72-in. electrically welded steel pipe	96,500 lb.	.25	.25	.20	"	"
57. Electrically welded steel pipe, installation only	93,081 lb.	.10	.09	.08	"	"
58. Cl. A conc. backfill around dam pipes	490 c. y.	20.00	22.50	25.00	"	"
59. Cl. B conc. backfill around dam pipes	210 c. y.	20.00	22.50	25.00	"	"
60. Furn. and install trash racks, roller paths, vent pipes, and stop log guides, and other struct. steel	270,000 lb.	.20	.22	.20	"	"
61. Furnish two self-closing Broome gates, for 6x8-ft. opening, and 350-ft. water head	Lump Sum	16,000.00	15,000.00	35,000.00	Bid separately in Aug. 6	
62. Furn. complete set of frames, guides and rolled steel transition sections for Broome gates (El. 1340) and elect. driven traveling gate hoist	Lump Sum	44,000.00	40,000.00	45,000.00	Bid separately in Aug. 6	
63. Add'l chain for gates at El. 1250 and El. 1265	Lump Sum	5,500.00	5,000.00	6,000.00	Bid separately in Aug. 6	
64. Install Broome gates, hoisting cables, chain and hoists	150,000 lb.	.09	.09	.075	150,000 lb.	.08
65. 72-in. Butterfly valves (270-ft. head) complete	2 ea.	22,000.00	28,000.00	32,000.00	Bid separately in Aug. 6	
66. 48-in. Butterfly valves (320-ft. head) complete	2 ea.	14,000.00	15,000.00	17,000.00	Bid separately in Aug. 6	
67. Install Butterfly valves, appurtenances	130,000 lb.	.09	.05	.075	140,000 lb.	.08
68. Concrete in diversion tunnel plug	3,500 c. y.	15.00	14.00	25.00	Unchanged	Unchanged
69. Furn. and inst. lumber for Howe Truss, in place	25,000 f.bm.	.20	.22	.175	20,000 f.bm.	.20
70. Furn. and inst. lumber for roadway	15,000 f.bm.	.15	.18	.15	18,000 f.bm.	.15
71. Galv. grab irons and U-bolts	(Not specified in Jan. 21 opening)				500 lb.	.30
72. 1½-in. galv. iron railing, single rail	(Not specified in Jan. 21 opening)				700 l. f.	4.00
73. 2-in. galv. iron railing, double rail	(Not specified in Jan. 21 opening)				200 l. f.	8.00
74. State sales tax, 3 percent	.....	208,104.54	233,552.39	291,606.00	.....	179,015.94

* Where quantities and unit prices are marked "Unchanged," they remain as subsequently reported for the January 21, 1943 opening. Results shown in columns (1) in both August and January openings are from the same bidder.

STORM AND SANITARY SEWER SAN FRANCISCO, CALIF.

OWNER: City of San Francisco, Dept. of Public Works, John J. Casey, city engineer.

PROJECT: Constructing combined storm and sanitary sewer (brick) on Jackson Street between Sansome and Battery Streets, in San Francisco. Sewer is 300 feet long, 11 feet in depth, and five feet in diameter. Project also involves relocation of some existing water mains, alterations to auxiliary water supply pipeline, and traffic control work.

CONDITIONS: City is to furnish the following pipe, fittings, etc., in connection with the water main relocation: 270-ft. of 8-in. bell and spigot cast iron pipe, Class 150; one 8-in. bell end gate valve; 1,200 lb. bell and spigot cast iron fittings; 100 lb. steel lugs and tier bars; six ¾-in. screw taps for services; and one 2-in. screw tap for services. Contractor to furnish all other material and complete work in 120 days. Underground water may be reached at a depth of approximately 10-ft. Rail and highway transportation facilities available to site of work. Minimum wage rates are: skilled labor, $1.2125 per hour; semi-skilled, $1.0625; and common, 95c.

LIST OF BIDDERS: (Bids received February 3, 1943)

1. M. J. Lynch, San Francisco, Calif. (low bidder) $39,610
2. Eaton & Smith, San Francisco, Calif 43,354

Item	Quan.	Unit Prices (1)	(2)
1. Three-ring brick sewer, 5-ft. diam	300 l. f.	$107.00	$126.00
2. 6-in. vitr. clay pipe side sewer	25 l. f.	7.00	2.75
3. 8-in. vitr. clay pipe side sewer	25 l. f.	7.00	3.00
4. 15-in. vitr. clay pipe sewer	25 l. f.	10.00	5.00
5. 10-in. vitr. clay pipe, culvert and side sewer	55 l. f.	8.00	3.00
6. Brick manholes on brick sewer	2 ea.	100.00	125.00
7. Brick manhole on vit. clay pipe sewer	1 ea.	350.00	200.00
8. 12-in. vitr. clay pipe subdrain	300 l. f.	3.50	1.50
9. Rock fill	120 c. y.	6.00	3.50
10. Relocate water main and service	Lump Sum	1,000.00	800.00
11. Alterations to A. W. S. system pipeline	Lump Sum	2,500.00	2,000.00
12. Traffic control work	Lump Sum	650.00	1,000.00

WATER DISTRIBUTION SYSTEM MILTON, WASHINGTON

OWNER: Town of Milton, Washington, Kay Kirkland, To Clerk; Parker & Hill, Smith Tower, Seattle, engineers.

PROJECT: Construction of reservoir and water distribut system in Milton, Pierce County, near Tacoma, Wash. Inclu furnishing and laying of asbestos-cement pipe, relaying wro iron pipe, service connections, connecting existing standpi to new main, and all necessary valves, boxes and cast iron f tings. Asbestos-cement pipe is 4-in. in diameter, and re wrought iron pipe is 2-in.

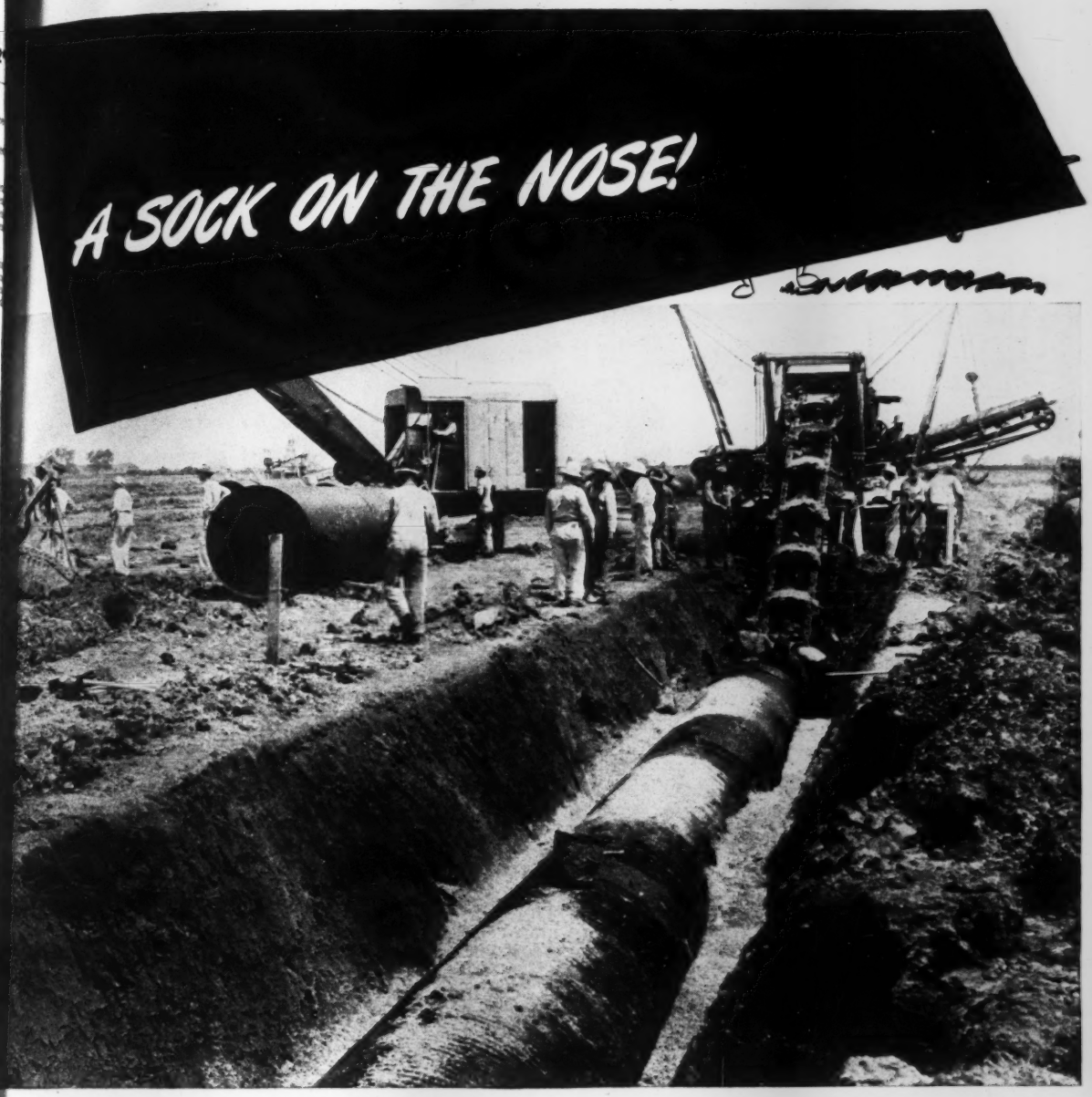
CONDITIONS: Contractor to furnish all materials and c plete work in 180 calendar days. Rail and water transpor tion facilities available to Tacoma, and highway to site work. Wage rates are: skilled labor, $2.00 per hour; se skilled, $1.50; and common labor, $1.10.

BIDS: Three bids were received December 10, 1942, ran from the contract low of $24,254 to $28,686. Engineer's e mate, $24,500.

LIST OF BIDDERS:

1. Neukirch Bros., Seattle, Wash. (contract) $24,
2. E. L. Burrows and James Milone, Tacoma, Wash. 27,
3. M. Moschetto, Seattle, Wash 28,

Item	Quan.	Unit Prices (1)	(2)	
1. Construct reservoir	Lump Sum	$10,800.00	$7,400.00	$18,0
2. 4-in. asbestos-cement pipe	6,600 l. f.	1.45	1.90	
3. Relay 2-in. wrt. iron pipe	1,660 l. f.	.75	1.00	
4. Service connections	40 ea.	5.00	80.00	1
5. Connect exist. standpipes to new 4-in. main	3 ea.	50.00	150.00	2
6. Take up 2-in. wrt. iron pipe	2,250 l. f.	.60	.50	
7. 4-in. pressure reducing valve	1 ea.	150.00	300.00	17
8. 4-in. gate valves	12 ea.	25.00	20.00	2
9. 2-in. gate valves	3 ea.	15.00	8.00	1
10. Valve boxes	18 ea.	10.00	10.00	1
11. Cast iron fittings	2,500 lb.	.10	.20	



s it your problem to provide adequate airport drainage nder shallow cover? If so, here's a ready answer. Flexi- e ARMCO Corrugated Pipe (plain or perforated) has oved ability to resist crushing, cracking or disjointing nder the impact and weight of heavy loads.

This means freedom from failure. You have continued surance of a firm, dry field with uniform support for nways or direct wheel loads. Operations are safer and racticable the year around. Even the effects of a heavy orm are but short-lasting.

ARMCO Pipe is also shatterproof — an important point in case the field becomes a military objective. Unskilled labor can easily make the installation, using long lengths joined together with sturdy band couplers. Shifting soils and severe frost action are no hazards.

Consider ARMCO Corrugated Pipe when you are planning or building essential war-time airports. Be sure to ask your local ARMCO man to show you the Manual of Airport Drainage. Or write to us direct regarding specific problems. Armco Drainage Products Assn., Middletown, O.

ARMCO ARMCO **CORRUGATED PIPE**

IF YOU CHISEL POINT YOUR PENCILS

SEND THIS COUPON TO

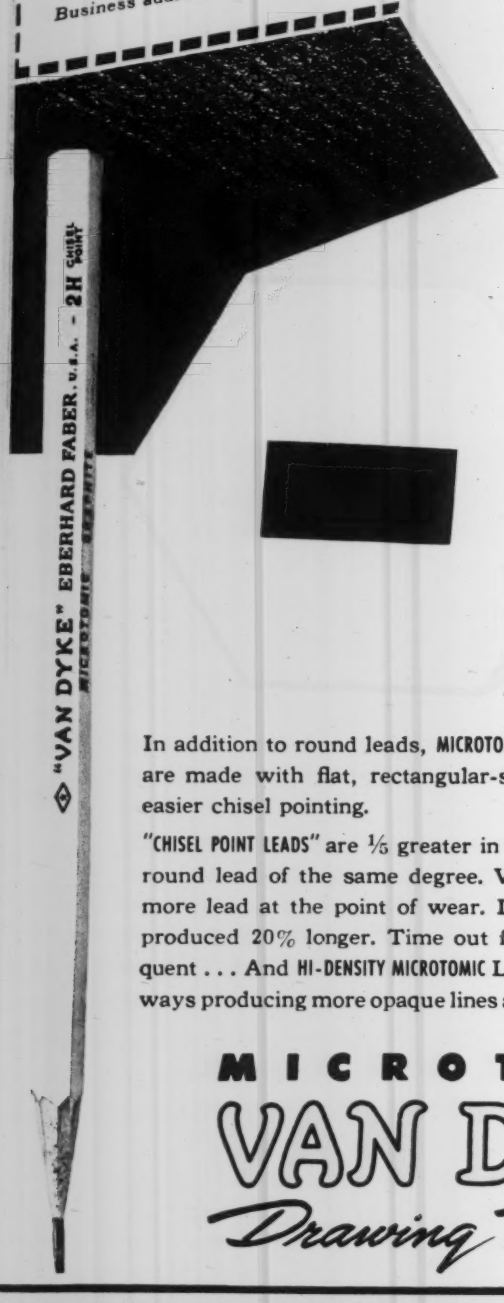
EBERHARD FABER PENCIL CO.
37 Greenpoint Ave., Brooklyn, N.Y.

Please send me, for free testing purposes, a MICROTOMIC "VAN DYKE" PENCIL with CHISEL POINT LEAD in_____degree (choice of 2H—4H—6H—HB—2B or 4B).

Name_____

Position_____

Business address_____



20% MORE LINE PRODUCTION BETWEEN SHARPENINGS

In addition to round leads, MICROTOMIC "VAN DYKE" Drawing Pencils are made with flat, rectangular-shaped leads for quicker and easier chisel pointing.

"CHISEL POINT LEADS" are ⅕ greater in their long dimension than the round lead of the same degree. When sharpened there is 20% more lead at the point of wear. Lines of unvarying width are produced 20% longer. Time out for repointing is 20% less frequent . . . And HI-DENSITY MICROTOMIC Leads have the advantage of always producing more opaque lines and sharper, clearer blueprints.

MICROTOMIC
VAN DYKE
Drawing Pencils

THE EBERHARD FABER DRAWING PENCIL WITH THE HI-DENSITY MICROTOMIC LEAD

(*Continued fr... p. 100*)

of the war, and Wilbur ... Smith, direc... has accepted an ap... tment at Y... University to do tra... research w... there.

C. R. McMillan, ... highway e... gineer, said the action ... abolishing ... traffic engineering divi... was a furt... step toward adapting ... highway ... partment to wartime ... nditions un... which its revenue has ... en greatly ... pleted.

The accident reporti... phase of ... work of the traffic eng... ering divis... will be done by the ... planning sur... office of the department.

• • •

Arkansas tells postwar road planning troubles

Because of loss of revenues and en... neering and technical men, the Arkans... State Highway Department has be... forced to plan on a comparatively sm... postwar road construction progra... W. W. Mitchell, director of the depa... ment told state legislators recently.

Though plans are indefinite, the D... partment has asked the legislature for ... $2,157,000 appropriation for postw... work. This appropriation would allo... $57,000 for preliminary surveys and $... 100,000 for construction.

"The state has not submitted a po... war program to the federal governme... because the department lacks sufficie... personnel to work out the plan," Mi... chell said. He added that the Depar... ment had lost many surveyors to th... armed services and war industries, an... said that the one surveying crew left ... working on emergency access roads ... war projects.

• • •

Bridge rentals held payable to road board

Recently, the Arkansas supreme co... ruled that moneys held by the Sebast... Bridge District from rentals paid ... utility corporations should be deliver... to the Arkansas State Highway Commi... sion toward maintenance of the Garris... Ave. span across the Arkansas River ... Fort Smith.

The court held, however, that the co... mission was not entitled to betterme... taxes collected by the district from ... property-owners.

The ruling partly reversed a Sebast... Chancery decree, but for the second tim... denied the highway commission the ri... to all the funds in the bridge distri... treasury.

The highway commission sued for ... the district's moneys on the ground th... they should go for highway and brid... maintenance because the state had tak... over maintenance of the span under th...

This "Carrot" means healthy metals

YOU CAN SEE why metalworkers call this lump of calcium metal a "carrot." This is the way it looks when it comes from an electrolytic cell in which it is made.

Calcium is a soft, silvery-looking metal. Although it is abundantly present in such common materials as chalk and limestone, its recovery as a pure metal is extremely difficult. Yet it is vitally essential to this country.

In the making of stainless or high-alloy steels, calcium drives out impurities, giving cleaner, better steel for casting or rolling. In magnesium casting, small amounts of calcium improve the finish of the surface and minimize scaling. Calcium is an essential in the making of many metals.

This hitherto rare metal has been made in this country only during the past few years. Before Europe exploded, the United States was dependent upon France as a source of supply.

But back as far as 1935, thinking that this country should have a domestic source, ELECTRO METALLURGICAL COMPANY, a unit of UCC, started a major research program. After four years of work . . . as French supplies dwindled . . . a plant was put into operation for the manufacture of the gray metal. Today, ELECTRO METALLURGICAL COMPANY produces many times as much calcium metal as this country ever imported . . . and production is increasing.

UNION CARBIDE AND CARBON CORPORATION

UCC

30 East 42nd Street — New York, N. Y.

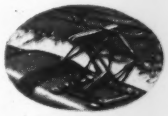
Principal Products

ALLOYS AND METALS
ELECTRODES, CARBONS AND BATTERIES
INDUSTRIAL GASES AND CARBIDE
CHEMICALS — PLASTICS

THE AIR SOONER! Vital craft parts flow from production lines quicker because use of calcium metal results in better metal.

BETTER HEALTH! Pure calcium metal is used as a drying and purifying agent in the manufacture of certain new disease-fighting drugs.

CHEMICAL HELPER! Calcium necessary in making a number of rare metals—many of which heretofore were unavailable commercially—and all of which are vital.



METAL-SAVER! In the melting of copper scrap for use in certain types of electrical equipment, calcium is used as a purifier and a restorer of electrical conductivity.

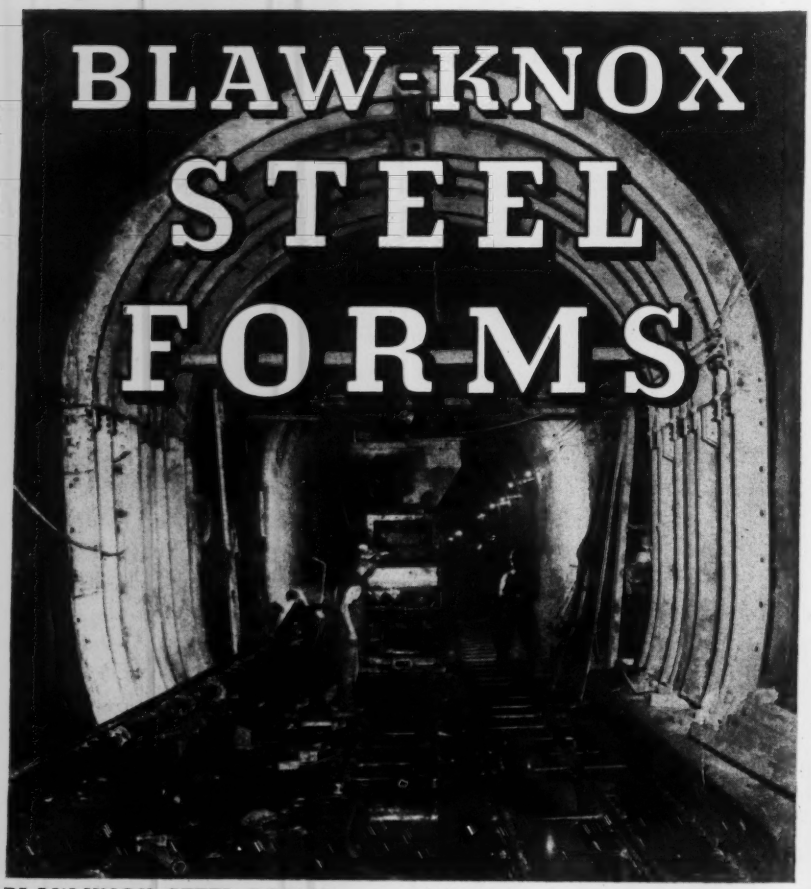
BUY UNITED STATES WAR BONDS AND STAMPS

Ready for your present and future construction planning

Blaw-Knox Steel Forms are designed for speed and economy in construction, and contractors have for many years utilized our specialized engineering service to plan their jobs.

Current construction work of a sufficiently urgent nature can be served, and long range planning for the proper handling of future jobs can be aided by experienced Blaw-Knox engineers.

The engineering facilities and services extended by Blaw-Knox form engineers are prized by all who have taken advantage of them. This service is offered in the interest of engineering progress and is free from any charge or obligation.



BLAW-KNOX STEEL FORMS are used for the construction of
TUNNELS WALLS SEWERS DAMS BRIDGES PIERS
CONDUITS ROADS SEWAGE DISPOSAL PLANTS . . .
. . . and other varieties of concrete construction

BLAW-KNOX DIVISION of Blaw-Knox Co.
2001 FARMERS BANK BUILDING PITTSBURGH, PA.
NEW YORK • CHICAGO • PHILADELPHIA • BIRMINGHAM • WASHINGTON

1941 refunding act ... under a ... panion measure had ... paid $... discharge the district's ... bonded indebtedness. The highway ... partment also in the suit that $20,0... worth of ... were needed on the bridge.

• • •

Russia completes huge Ural steel plant

The first section of the Chelyabinsk Iron and Steel Works, located east of the Ural mountains, has been completed and is ready for operation, according to information made available to the Soviet news agency.

The plant is said to be the nation's largest production unit for high quality steel. It is located north of the manganese iron center of Magnitogorsk, and the new works there was begun as part of a program to establish many major industries in the safety of the Urals.

Construction was started in April, 19..., the Soviet agency said.

• • •

Pennsylvania road traffic 27.7 percent less in 1942

A final report reflecting the effect of gas rationing on traffic over Pennsylvania highways during 1942 has been released by the planning division of the highway department.

The data was secured from 30 permanent automatic traffic recorders placed so that they gave a fairly good cross section of the whole traffic setup. The decrease for the month of December 1942, when nation-wide gasoline rationing became effective, was 49.4 per cent less than in December, 1941. The total cumulative decrease for the year 1942 was 27.7 per cent less than for 1941.

BRIEF NEWS

Four high speed, newest type elevators have been installed in the Grand Coulee Dam and power house reported the U. S. Bureau of Reclamation. One of the lifts installed in the dam is the largest passenger elevator in the United States. It can easily carry 30 persons, travels 500 ft. per minute, and the elevator shaft extends 362 ft., the equivalent of a 30-story building, into the heart of the massive concrete structure, giving access to the outlets of the ... miles of galleries or hallways inside the dam.

Estimated lumber consumption during 1942 was about 38 billion feet, nearly 10 percent more than in 194... Of the 31 billion feet of estimated lum...

Amberlite

ION EXCHANGE RESINS

For large scale production OF DE-IONIZED WATER *at low cost*

THE production of "De-ionized" water—water comparable in degree of purity to distilled—was made possible for the first time by the introduction of the AMBERLITE Synthetic Ion Exchange Resins in 1940.

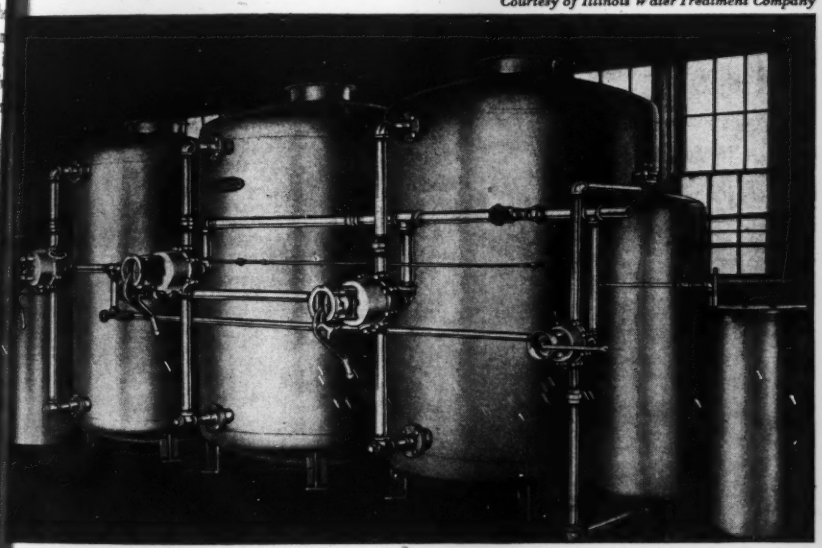
Commercial installations of these Ion Exchange Resins De-ionizer units are in operation in a wide variety of industries where the use of very pure water in quantity is of vital importance. De-ionized water, being completely salt-free, is playing an important part in the synthetic rubber, pharmaceutical, distilling, mirror and other process industries.

Water conditioning represents but one of the possible fields of application for these unique products. The de-ionizing of sugar solutions and of gelatine, the removal of injurious heavy metals from a variety of chemicals, the de-acidification of formaldehyde, represent but a few of the many special applications now possible. Because of the inherent flexibility of the AMBERLITE Ion Exchange Resins, the possible range of applications is almost unlimited.

Have you considered this unique process in your own industry where problems of increased supplies of distilled water, condensate substitution, or other special water conditioning processes are involved?

For further data on AMBERLITE Ion Exchange Resins write the Resinous Products & Chemical Company, the sole producer of these resins in the United States.

Courtesy of Illinois Water Treatment Company



Typical AMBERLITE Ion Exchange unit producing 4,500 gallons per hour of De-ionized water—comparable to distilled water—in a synthetic rubber plant.

AMBERLITE ION EXCHANGE RESINS OFFER YOU:

1. Complete De-ionization.
2. High reaction velocity permitting high operating flow rates.
3. High capacity — decreasing the number of regenerations and prolonging operating cycle.
4. Sharp break-through — no gradual increase in salt concentration.
5. Low operating cost.
6. Simple, trouble-free equipment.
7. The complete removal of heavy metal traces.

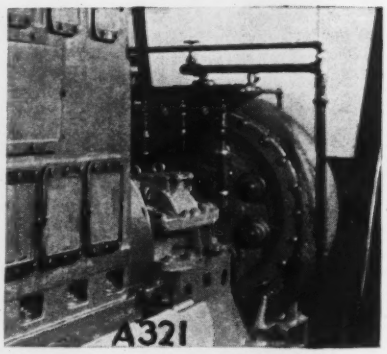
THE RESINOUS PRODUCTS & CHEMICAL COMPANY

WASHINGTON SQUARE, PHILADELPHIA, PA.

Amsco "Counterflow" Dredge Pump, Rotary Cutter and Pipe Line Fittings *Used on This Dredge*

The Hancock County Board of Supervisors, with headquarters at Bay St. Louis, Mississippi, early in 1941, commissioned their Dredge "W. J. Gex." Its primary function is building sloping beaches against the front faces of step-type sea-walls, to prevent tidal water current erosion of footings and back-fills, and to afford protection against annoying washouts of the beach boulevard system on Hancock County's Mississippi Gulf Coast. These beach fills can be easily refilled or repaired in event of storm washouts without interfering with shore traffic.

The dredge was designed and built by Lester F. Alexander Company, of New Orleans, Louisiana at their plant on the Industrial Canal. It is an 8-in. pump size, with 10-in. suction diameter, hydraulic pipe line dredge for excavation of sand, gravel, mud and clay beach materials, and is equipped with a rotary cutter, ladder, and spuds. Power is furnished by diesel engines. The hull, ladder and rigging frames are all-steel arc-welded construction. The cabin is timber framed and wood siding. It is not self-propelling, but is moved and attended by a tug.



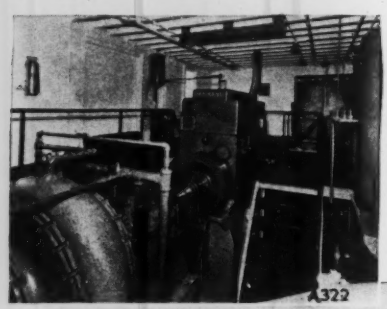
For production, an 8" Amsco, Type "H-CF," Form 40, Heavy Duty Dredge Pump is used. It is "Counterflow" water seal construction, right hand, 30 degree upturn discharge. Individually powered, it is directly connected through a flexible coupling to a diesel engine, 5 cylinders 10" x 12", rated 240 H.P. at 514 R.P.M.

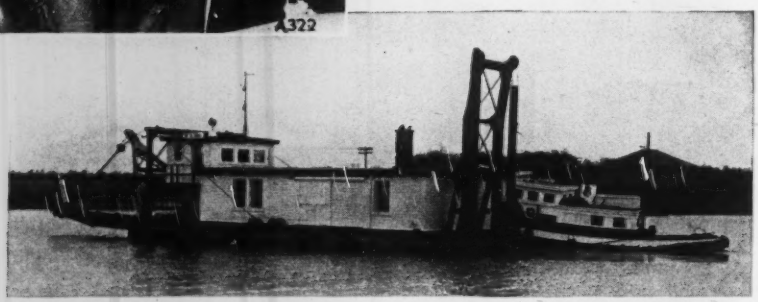
All other equipment is individually electric motor driven with power furnished by an auxiliary diesel-electric generator set.

The dredge pump water end parts, all hull pipe line fittings and the rotary cutter are made of Amsco impact and abrasion resistant manganese steel, "the toughest steel known."

This machine is well planned and staunchly built for efficiency and low-cost operation. With pipe lines from 2000 to 3000 feet long, and a 6 to 10 ft. lift it has performed in a most successful manner.

A bulletin is available completely describing Amsco Dredge Pumps, Pipe Line Fittings and Rotary Cutters.





Amsco
AMERICAN MANGANESE STEEL DIVISION
Chicago Heights, Illinois
THE AMERICAN Brake Shoe AND FOUNDRY COMPANY
FOUNDRIES AT CHICAGO HEIGHTS, ILL., NEW CASTLE, DEL., DENVER, COLO., OAKLAND, CALIF., LOS ANGELES, CALIF., ST LOUIS, MO.
OFFICES IN PRINCIPAL CITIES

ber requirements in [illegible] 43, 35 [illegible] expected to be used [illegible] boxing, [illegible] and shipping.

Assistant Dean D. [illegible] Terrell [illegible] College of Engineering [illegible] of the University of Kentucky has announced that the university would offer four war [illegible] ing courses under sponsorship of the United States Office [illegible] Education, beginning March 15. Classes in [illegible] management, industrial [illegible] management, engineering drawing, and pre-engineering mathematics are to meet two [illegible] each week.

Kern & Kibbe, veteran Portland, [illegible] construction concern, has laid the [illegible] for the first of 16 wooden barges [illegible] have been contracted for by the United States Engineers. To handle the [illegible] construction, Kern & Kibbe have constructed a new plant. The plant [illegible] four ways and has facilities for building two barges at a time.

The recent addition of Southern California's construction industry to the War Manpower Commission's volunt[illegible] job stabilization plan will regulate [illegible] of approximately 150,000 workers. The plan was devised by the Southern California area war manpower committee representing labor and management, was announced by H. R. Harnish, [illegible] manpower chief. It is intended to stop pirating and needless migration of workers by requiring that no one be hired without a certificate of availability from his last employer, signifying release from a previous job.

Floyd Booe, manager of the Northern California Associated General Contractors, has revealed that hundreds of pieces of heavy construction equipment used principally before the war on road work and since then for preliminary excavation and grading on essential war construction projects, now are idle and operating crews are drifting to other employment. From the Sacramento area many pieces of road and other heavy machinery have been sent elsewhere, mainly to South America for use on the Pan American Highway now under construction.

Completion of additional units of the Deer Creek reclamation project in the Salt Lake area of Utah as soon as possible is necessary to avert serious shortage of water in that district, according to Charles B. Burdick of Chicago, leading hydraulic and sanitary engineer who has been asked to make recommendations in this connection. The shortage of water, Mr. Burdick says, would affect both civilian residents and war projects in the Salt Lake area. Although Deer Creek Dam in Provo Can[illegible]

LET'S KEEP 'EM MEASURING

TODAY buyers have more reason than ever to be glad that they bought the best quality meters, those designed to last for years. Under present conditions it may be difficult for many to secure all of their requirements in new measuring equipment. Here is when the value built into Pittsburgh-National Meters will prove its worth, for these meters have been designed with those extras that provide high performance standards even after serving a normal life span.

Pittsburgh-National Meters, too, are economical to repair and replacement part stocks are adequate. An intelligent program of meter reconditioning and maintenance can, in many cases, largely supplant the need for new meters.

To aid in keeping them measuring for the duration, we have in recent months reworked many of our old parts bulletins and issued new ones so as to simplify the matter of ordering replacements. Contact the nearest Pittsburgh-National District Office for the literature you need.

WHEN YOU BUY NEW METERS

THE *Empire* VICTORY METER

Top measurement value in so-called War Model Meters is provided by the Empire Victory and the Pittsburgh Ironside. Both have fully rust-proofed cast iron cases; both are fitted with the Pittsburgh-National developed molded glass register box; both conserve over 70% of the bronze normally used in the construction of meters of this size. After the emergency is over, these meters can be readily converted to bronze cases if desired.

The Empire Victory Meter employs the time-tested, oscillating piston principle of measurement, using the famous Empire balanced piston. The Pittsburgh Ironside Meter is of the popular disc type, having the same inner-working mechanism that has been proven in thousands of Pittsburgh Arctic and Tropic Meters. Both are accurate measuring instruments, each possessing its own individual characteristics. Together they provide the necessary types to handle practically every domestic meter requirement or preference of water works men.

THE PITTSBURGH IRONSIDE METER

PITTSBURGH-NATIONAL METERS

THE MOST COMPLETE LINE OF WATER METERS IN THE WORLD

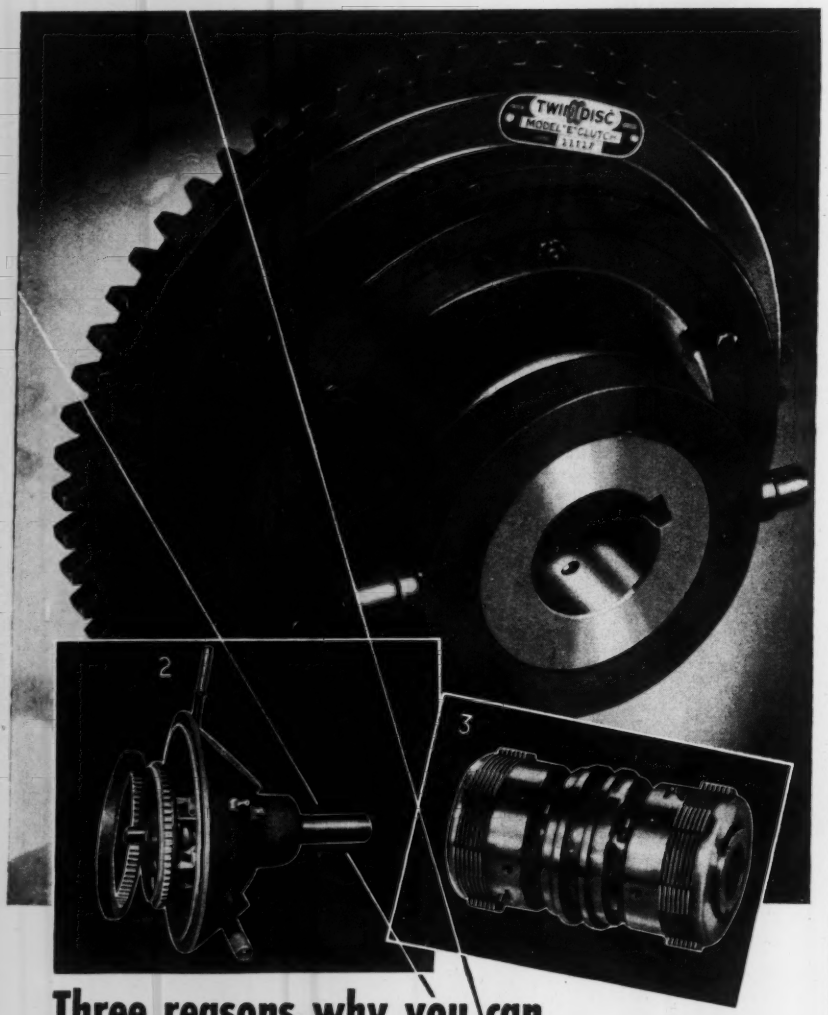
PITTSBURGH EQUITABLE METER COMPANY

NEW YORK · BROOKLYN · DES MOINES · MEMPHIS · OAKLAND · TULSA · CHICAGO · BOSTON

MERCO NORDSTROM VALVE COMPANY
Main Offices, Pittsburgh, Pa.

NATIONAL METER DIVISION, Brooklyn, N. Y.

KANSAS CITY · PHILADELPHIA · SAN FRANCISCO · LOS ANGELES · SEATTLE · HOUSTON · COLUMBIA · BUFFALO



Three reasons why you can depend on long wear-life from your

1. Twin Disc Clutches are engineered in close cooperation with the builder of the unit . . . designed to enhance the performance of any machine in which they are used.

2. Because of a dual responsibility: *First*, to the user of the machine; *second*, to the builder of the machine, no single part in a Twin Disc Clutch can be left untested . . . its work-life undetermined.

3. As a further protection, Twin Disc engineers are constantly on the alert, in the field, checking the performance of Twin Disc Clutches *in operation*, to make doubly sure they amply meet the working conditions.

TWIN DISC
CLUTCHES AND HYDRAULIC DRIVES
REG. U. S. PAT. OFF.

And to assure uninterrupted performance under present demands for tremendously increased production, the Twin Disc Clutch Company maintains seven factory branches and thirty parts and service stations where competent men and ample parts stocks are immediately available. TWIN DISC CLUTCH COMPANY, Racine, Wisconsin.

1. *Twin Disc Model E Clutches, heavy-duty, enclosed type. Sizes: 14" to 42" in single or two-plate assemblies.*

2. *Twin Disc Power Take-off for engines having up to 285 hp. output. Sizes: with single plate clutches, 6½" to 24"; double plate, 11½" to 18". Housing sizes: No. 6 S. A. E. to No. 00 S. A. E.*

3. *MTU Duplex Machine Tool Clutch.*

TWIN DISC CLUTCH COMPANY • RACINE, WISCONSIN

yon now is completed forming a ... voir capable of storing 100,000 ... of water, only 10,000 ... has been gathered in ... reservoir.

The Manhattan Construction ... Muskogee, Okla., and the S. E. ... Construction Co., Fort Smith, Ark., ... be awarded the Army-Navy "E" ... excellence for their work in building ... the expansion at Camp Chaffee, Ark.

Authorization has been issued ... Washington to rush completion of ... veys and purchases of about 20... acres of land to be used in connection ... with a new High Point, N. C., hydro-electric project, and the first purchases of land have been made.

Dean A. A. Potter, of the Purdue University Engineering School advocates the creation of an industry reserve similar to the Army and Naval reserves to insure training of enough students in vitally-needed war production service. Dean Potter said that American engineers and scientists are far too few to carry the tremendous task entrusted to them at the present time.

State Senator Thomas C. Desmond, chairman of the Senate Committee on Affairs of Cities, to which all housing bills are referred, has introduced a bill in the New York legislature to provide $150,000,000 in state loans to communities for postwar housing. Senator Desmond, speaking at a meeting of the Citizens' Housing Council of New York recently, said that unless New York State plans now for postwar housing, New York City and upstate communities will face an acute housing shortage when the war ends.

The Army and Navy have recommended spending of approximately $17,500,000 for construction of access roads to military and naval reservations and raw materials sources in Alabama, Florida and Georgia.

The Chicago, Milwaukee, St. Paul & Pacific Railroad is planning the construction of eight miles of new track in Dallas County, Iowa, so as to make possible the elimination of the use of the high bridge across the Des Moines River. Other railroad construction news is that the Chicago, Burlington & Quincy Railroad is planning the rebuilding and improving of its railroad depot at Burlington, Iowa at a cost of $150,000. The Manufacturers Railway Company has awarded a contract to the W. C. Hartigan Construction Co. for the erection of a brick carloading warehouse in St. Louis, Mo.

Flow of the Red River through the outlet works of the $50,000,000 Denison

Beating Schedules on the Ground

...to beat the Axis in the air!

...with Buckeye Spreaders

THE speed and accuracy of Buckeye Spreaders has helped surface many a runway at schedule-beating pace, extending the network of training, fighting and transport fields that will soon add up to overwhelming air superiority over the Axis.

Fast, accurate and versatile, Buckeye Spreaders deliver the *most* out of every precious hour, out of every yard of costly, hard-to-get material . . . *facts* that mean speed and efficiency on essential airport construction and maintenance jobs. Write or wire for complete information.

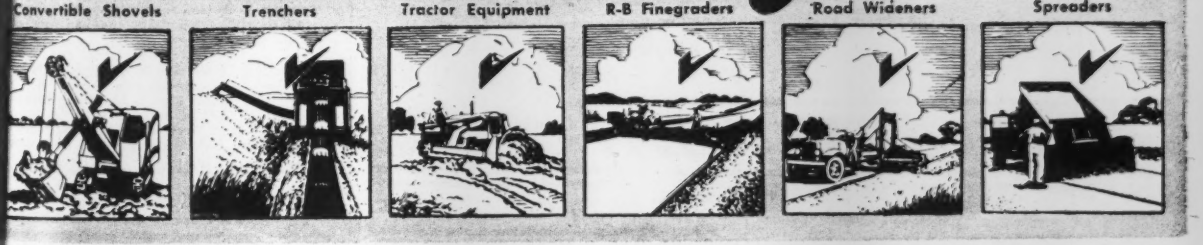
The Buckeye Traction Ditcher Co.
Findlay • Ohio

50 YEARS OF PROGRESS BUCKEYE

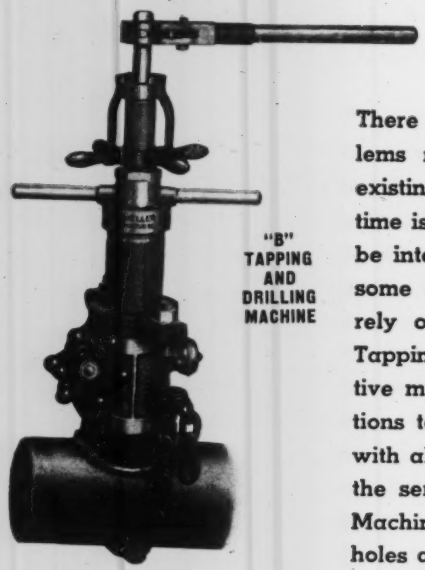
PHOTO—Buckeye Spreader laying a chip course over oil base at one of Pan-American's new bases "out yonder".

Built by Buckeye

See our advertisement on pages 20 & 39



CAN YOU DRILL AND TAP UNDER PRESSURE ?



"B" TAPPING AND DRILLING MACHINE

There are lots of construction problems requiring a connection to an existing pipe line; situations where time is important, or service must not be interrupted by costly and bothersome shut-downs. For such cases rely on the MUELLER Drilling and Tapping Machine . . . Here is a positive method of making such connections to water, gas, or oil pipe lines with absolute safety and no break in the service. With the MUELLER "B" Machine shown here you can drill holes and tap them, can insert corporation stops and pipe plugs, or remove them. Or exchange a smaller stop for one of a larger size — and all under pressure! . . . The MUELLER "B" Machine is well made to stand years of hard usage. You can operate it in any position since the ratchet handle is free to swing in a full circle. Each combined drill and tap is made of high grade tool steel, properly tempered, and carefully ground. Stays sharp much longer, bores clean holes, and cuts sharp threads . . . We make other models and sizes to fit many conditions. Write us for more complete information.

★ ★ ★ ★ ★ ★ ★

MUELLER CO.

CHATTANOOGA, TENN.

Dam near Denison, Texas, will be tailed in June and is expected to Preston Bridge, 10 miles upstream have to be removed within a month the flow is halted. Plans for disposing this and other bridges in the Dam basin are being studied by G. Carter of Dallas, War Production Board representatives and the District Army Engineers and County officials.

Federal Judge W. Calvin Chesnut Baltimore has ruled that it is the ticular activities of an employee determines whether he is engaged interstate commerce and not merely fact that the employer is engaged stantially or even generally in interstate commerce. This decision is of interest contractors. In so holding, Judge Chesnut decided that an individual working as a cement finisher or concrete worker for a construction company is not gaged in interstate commerce and entitled to recover unpaid overtime pensation under the Fair Labor Standards Act.

In its efforts to cut down its tax budget, the House Finance Committee the West Virginia legislature has $11,000,000 from the 1943-45 budget. This will mean a big cut in the funds public assistance and road building

Compact! Powerful!

DISTRIBUTABLE CONTROL POWER

with ALL STEEL HAND HOIST

SEATTLE, U.S.A.

★

Money Has Been Saved on These

1200' assembled pipe (132 Tons) were lowered to bed of Mississippi at St. Paul with 9—5-Ton Beebes, three lines to each hoist through blocks.

Hudson River Bridge sidewalks were laid in sections with 32—5-Ton Beebes.

Longest wooden trusses in world were installed with ONE 5-Ton Beebe after power hoists proved impractical.

★

When raising, lowering, or placing costs by are a serious problem, the answer is the number of Beebe Bros. All Steel Hand MANNED IN UNISON. Available in 2, 5 Ton sizes. Sold through leading dealers trade centers. List of dealers sent upon request

BEEBE BROS., 2720 6th Ave. S., Seattle,

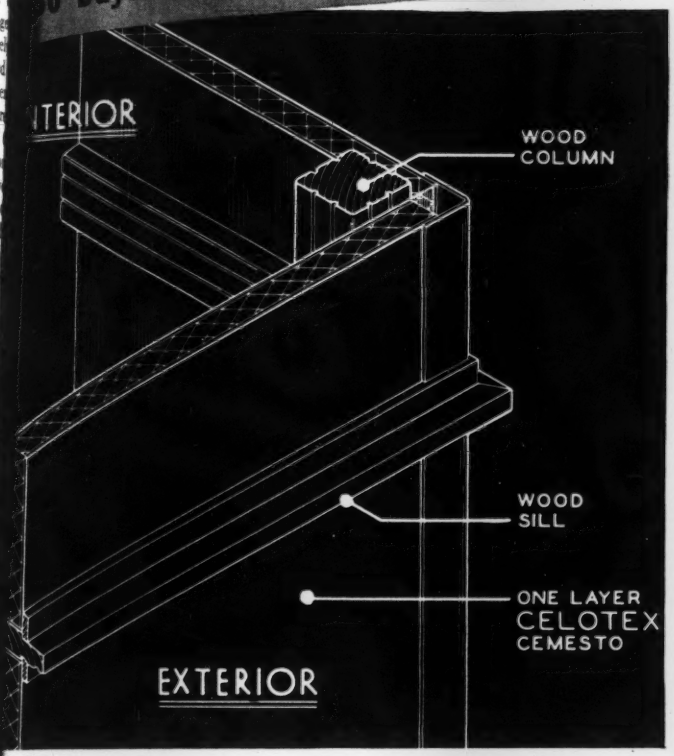
★

"THE STRONGEST GEARED POWER FOR ITS WEIGHT IN THE WO

AIN CEMESTO SPEEDS WAR HOUSING!

600 Units in a Florida Project!

85 Families Moved In
0 Days After Construction Started!



Cemesto Wall Units Combine Strength, Insulation, Permanent Exterior and Interior Finish

ERE is another startling demonstration of the speed with which esto construction may be com-ed! Within 30 days from the date arting construction on a 600-unit rida housing project, 85 families ed into their new homes!

emesto is a fire- and moisture-re-nt wall unit composed of a cane insulation core with a cement-stos covering on both sides. It is a bined material making a rugged insulated wall section with complete exterior and interior surfaces, and is equally practical for housing and for industrial construction.

By eliminating much of the lumber and nailing required for conventional construction, Cemesto accomplishes a tremendous saving in critical materials. Get complete information now! Mail the coupon today for booklets bringing you the whole fascinating story!

CELOTEX
CEMESTO
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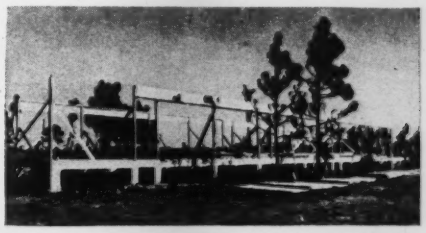
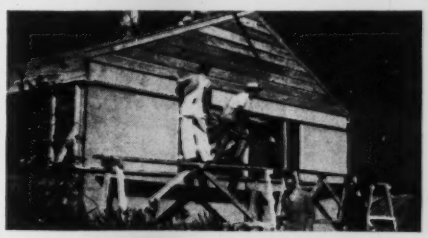
The word Celotex is a brand name identifying a group of products marketed by The Celotex Corporation.

HE CELOTEX CORPORATION • CHICAGO



A bare minimum of wood framing is needed because Cemesto possesses great structural strength.

Cemesto units expose clean, light, inviting surfaces, require no other interior or exterior finish.

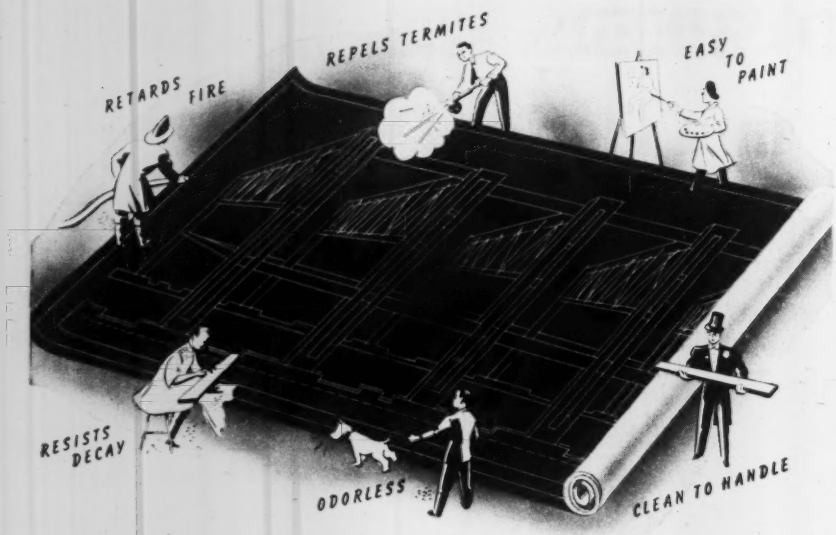


Because Cemesto handles easily, houses go up fast, are ready for occupancy in a hurry.

Completed Cemesto dwellings are neat, trim, pleasant to look at and comfortable to live in.

THE CELOTEX CORPORATION, CHICAGO ENR 3-25-43
Please send at once, free of charge,
☐ 28-page booklet, "A Vital Contribution"
☐ Portfolio of "Cemesto with Wood Framing"

Name .....
Address .....
City .....
County ..... *State* .....



Cuts Maintenance Costs

CHROMATED Zinc Chloride-treated lumber has three features which will help cut maintenance costs. It resists decay . . . repels termites . . . and retards fire. It's also clean to handle . . . easy to paint . . . and odorless.

MANY TIMES LONGER LIFE

Consider the savings in maintenance costs on structural timber, flooring and roofs—wherever lumber is expected to stand up under severe service conditions—when durability and useful life are extended because it resists decay and termites. That's the *bonus* in durability paid by treatment with CZC.

WHAT'S THE COST?

Actually, CZC-treated timber costs little. Here's the reason. CZC treatment permits the use of less expensive woods—which become more lasting than better grades untreated.

Further savings are found in the reduction of need for oversizes to compensate for loss in strength due to decay.

Of particular interest to engineers is the measurable fire resistance possible with CZC treatment. Results of fire tests will be released soon.

GET THE FACTS TODAY

Why not get *all* the facts today? Write for booklet—"Facts About Lumber Treated with 'CZC'." Grasselli Chemicals Department, E. I. du Pont de Nemours & Co. (Inc.), Grasselli Chemicals Dept., Wilmington, Delaware.

DU PONT
REG. U.S. PAT. OFF.

CZC

CHROMATED ZINC CHLORIDE
WOOD PRESERVATIVE

BETTER THINGS for BETTER LIVING . . . THROUGH CHEMISTRY

will also cut into [illegible] appropriations. The [illegible] road commission the state had sought [illegible] $8,000,000 for way work and this [illegible] me down to $6 000. Of the $1,060,000 asked for commission administration, the [illegible] granted $957,000.

Despite war created shortages in and materials, the Pennsylvania Highway Department built 62 b of more than 20-ft. span, eliminat railroad grade crossings, and imp 1,053.88 miles of roads and stree the state system during 1942. In tion, 624.9 miles of road, uncom at the end of 1942 and not includ the figures above, are under con tion. This figure includes access to provide effective connections be war production plants and em highways.

For the second straight year, State college students won all cash p in the annual student bridge d competition sponsored by the Ame Institute of Steel Construction. The ners were George W. Russell, $200; Clifford Prall, second, $100; Curtis D. Hicks, third, $50. Fou the five honorable mentions also won by Iowa State architectural neering students. Sixty-two students six colleges competed.

GRIFFIN

GRIFFIN

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Send for our New 60 pa illustrated catalog "GRIFFIN POINTED WELLPO FACTS" chock full of latest in mation on Wellpoint Systems dewatering, emergency and p manent water supply syste also information on press pumps and data for jetting.

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When SPEED is Essential

—Instantaneous Dumping Counts

Koehring Dumptors have the war speed so vital for essential military projects. As in peace-time, Dumptors are now hauling dirt and rock at high speed for the armed forces, here and overseas. Instantaneous dumping saves seconds, increases trips per hour, assures full loads every trip. All types of material are dumped clean every time. Remember the Dumptor and its many cost-cutting features, when they are again available for peace-time projects.

KOEHRING COMPANY
MILWAUKEE • WISCONSIN

Depend on your Koehring distributor to help you keep your equipment operating. Care for your Koehring equipment NOW, so it will serve you tomorrow. Koehring distributors have genuine Koehring parts. Koehring parts warehouses are at your service.

HEAVY-DUTY CONSTRUCTION EQUIPMENT

WILLIAMS *Buckets*

BUILT BY **WELLMAN**

MULTIPLE ROPE AND POWER ARM • POWER WHEEL • DREDGING • STEEL MILL • DRAG-LINE BUCKETS

⅜ to 16½ yds. capacities

BUILT TO LAST–

Welded Rolled Steel Construction Means Great Strength and Longer Wear!

and MOVE DIRT FAST

Williams Buckets are balanced and designed for digging power and fast action. An operator can make time with a Williams Clamshell or Dragline.

Send for free bulletin covering types of buckets for your particular requirements. It shows details of design and many exclusive features that clearly prove why your next bucket should be a Williams.

THE **WELLMAN** ENGINEERING CO.
7000 Central Ave.,
Cleveland, O.

NEED A BIG Trailer?

La Crosse Makes Them Up To 200 Ton Capacity-

** WRITE OR WIRE **

LA CROSSE TRAILER & EQUIPT. CO.
LA CROSSE, WISCONSIN U. S. A.

DE LAVAL STEAM TURBINE CO.
TRENTON, N.J.

Manufacturers of

STEAM TURBINES . . . HELICAL and WORM GEARS . . . PUMPS: Centrifugal, Propeller, Clogless, Mixed Flow, Rotary Oil . . . Pump Priming Systems . . . CENTRIFUGAL BLOWERS and COMPRESSORS.

Safety Shoe Standards

Five standards for safety shoes just been completed by the Am Standards Association at the req the War Production Board. The these, "Specifications for Men's Toe Shoes" (Z41.1-1943), provid form requirements for a work sh a steel toebox that will adequate tect the worker from falling objec specifications may be obtained *American Standards Association, 39 St., New York, N. Y., at 20 c copy.*

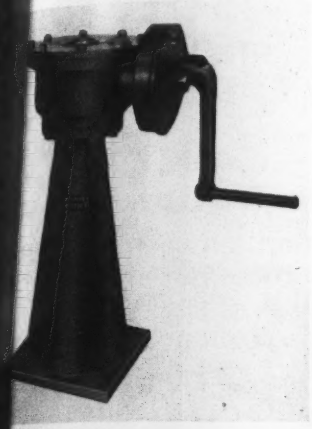
Better Vision for Welder

Goggles equipped with new Nov Didymium lenses enable a flame-w to look right through the cloudy y flame of burning sodium vapors, and see the rod and the molten area sharply. This clearer vision incr his efficiency in every phase of the ing operation, particularly the welding of aluminum and steel. lenses also protect eyes by abso the harsh, tiring invisible ultra- and infra-red rays generated d welding.—*American Optical Co., S bridge, Mass.*

Flame Color Chart

Prepared particularly for guidan new welders, a new chart of oxy- lene flame adjustment shows n color photographs of five fundam flame adjustments, as follows: (1) a lene burning in air, (2) a strongly burizing flame, (3) slight excess acetylene flame, (4) neutral flame.

ing flame. Being so completely it conveys the proper appear- he various welding flames faster accurately than any amount of e instruction. Desired quanti- ese charts may be obtained on *Air Reduction Co., 60 E. 42nd York, N. Y.*



Heavy Duty Hoist

ntly there has been designed a ely new line of floor stand hoists ew stem gates such as are used als, reservoirs, and other water ling projects. The new types are lly compact, strong and easy to . They include the use of the ardened gears, most efficient seals mpact anti-friction bearings. The s are removable. The floor stands selective two-speed gear ratios. ermit the gates to be stopped and any stage of opening. These new are made in a complete range of for different loads.—*The Rodney Machine Co., Orange, Mass.*

Traffic Marking Paint

new type of traffic zoning paint gives street and floor marking of al permanence and visibility, is n production. Applicable on wood,

Foundation TESTS of

NDISTURBED SOIL

its natural state, position, ndition and ASSOCIATION ith the

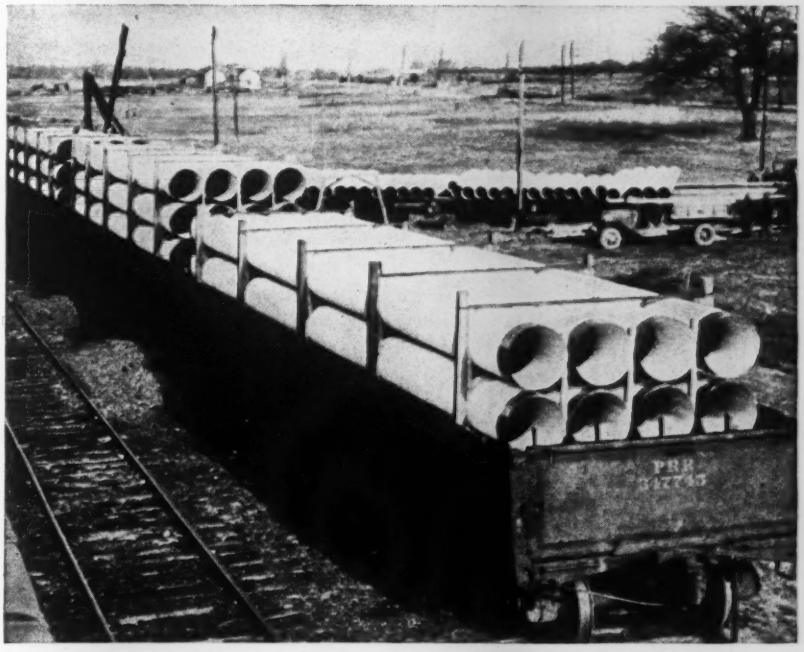
Le Mieux

RITOMETER

UBSTRATA ENGINEERS, INC.

ritime Bldg. New Orleans, La.

The Pipe of Peace Has Gone To War



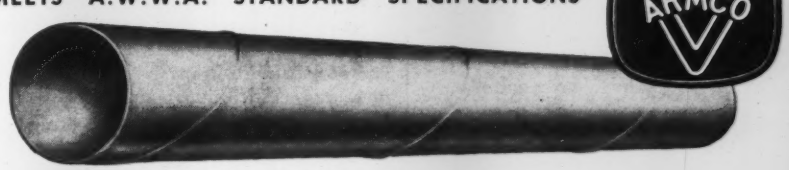
The same ARMCO Spiral Welded Steel Pipe that was the choice of so many engineers for peacetime water supply and force mains is now being used on vital war projects.

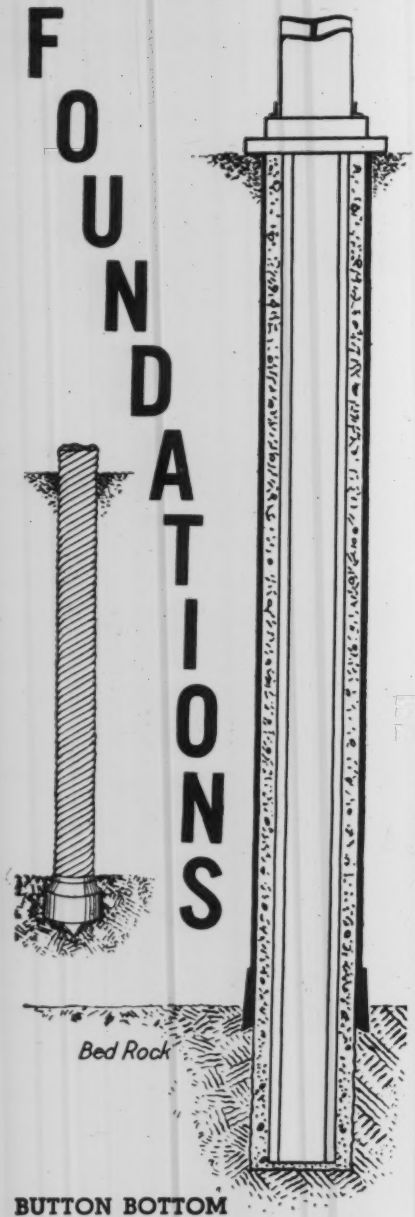
Here, of course, it will continue its record for efficient, maintenance-free service. A spun-enamel lining assures high flow capacity, prevents tuberculation and recurrent cleaning troubles. Fifty-foot lengths mean fewer joints, less assembly work. And ARMCO Steel Pipe has an ultimate strength of 50,000 to 60,000 pounds per square inch to guard against shattering and sudden breaks. Sizes range from 6 to 36 inches, with wall thicknesses in any diameter to fit specific jobs.

Remember, if you can't get ARMCO Pipe now for other than the most important war projects, it is because the steel is going into tanks, trucks and ships. After the war ARMCO Steel Pipe will be ready again to meet your every requirement. Meanwhile, write for full data. The American Rolling Mill Company, Pipe Sales Division, 721 Curtis Street, Middletown, Ohio.

ARMCO STEEL PIPE

MEETS A.W.W.A. STANDARD SPECIFICATIONS





BUTTON BOTTOM
COMPOSITE—STEEL PILES
COMPRESSED CONCRETE
CAISSON PILES

DRILLED-IN CAISSONS

Engineers available for consultation on any foundation problem. Catalogues on request.

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WESTERN FOUNDATION CO.
WESTERN CONCRETE PILE CORP.

308 W. Washington St. Chicago, Ill.
52 Vanderbilt Ave. New York, N. Y.

stone, asphalt, wood-blocks, composition and cement, it does the marking job in one coat according to the manufacturer. On creosoted blocks, a special primer is furnished to prevent bleeding. It dries for traffic in 20 to 30 minutes. It can be applied by lining machine or hand brush, leaving a clean, scuff-proof line or letter. Shipped in 55-gal. drums, 5-gal. kits.—*Thomson-Porcelite Paint Co., 829-35 N. Third St., Philadelphia, Pa.*

Gluing Blueprints

Extensive use of large-scale blueprints has introduced a new casein-bound "paper adhesive" which gives a quick, permanent adhesion, eliminating slippage of the joints according to the manufacturer. It also furnishes a glue bond which will withstand the various baths to which the jointed blueprint paper is subjected while the paper is traveling through the machine.—*I. F. Laucks, Inc., Seattle, Wash.*

Asbestos Building Board

To help meet the current urgent need in industrial operations for materials to take the place of sheet metal, various forms of lumber and other items which are either scarce or under necessary wartime restrictions, there has recently been introduced a specially fabricated asbestos-cement, all-purpose building board. It is made of asbestos fiber and portland cement; is fireproof, rotproof, vermin-proof and rust-proof, has unusual strength, and needs no paint. The board is made in three thicknesses—$\frac{3}{16}$ in., $\frac{1}{4}$ in. and $\frac{3}{8}$ in., and is said to be flexible and easy to work. It can be readily sawed or scored, drilled and nailed.—*The Ruberoid Co., 500 Fifth Ave., New York, N. Y.*

ALMEGA
Still at it!

TOUGH ENGINEERING PROBLEMS
SOLVED
CONSTRUCTION JOBS
BLITZED
CONCRETE
PRESSURE SPRAY PROCESS
BUILDINGS - FOUNDATIONS
STORAGE TANKS - PLANTS
SILOS
WE DESIGN AND BUILD
ON TIME
ANYWHERE

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CONCRETE
VIBRATORS

PAVEMENT VIBRATORS
Three types: *Vibrating* screed, full-width, propelled by hand-operated winch and cable or pushed ahead by finishing machine. Gasoline power plant.
Tubular internal, extending entirely across slab, mounted in front of finisher. Gasoline or electric power plant with flexible shaft drive.
Vibrating pan, full-width, carried by two-wheeled trailer behind any standard finisher. Gasoline or electric power plant.
STRUCTURAL CONCRETE VIBRATORS
1, 3, and 4 H.P. gasoline, air-cooled 4 cycle motors; flexible-shaft drive; interchangeable vibrator heads lubricated for life. Wheelbarrow carriers.

Pioneers in Concrete Vibration

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VIBRATOR CO.
1539 WOOD STREET, PHILADELPHIA, PA.

A new runway paved in a week or less with SOIL-CEMENT

Mixing train and finishing equipment in operation on a soil-cement airport project in the west.

35,011 sq.yd. in 18¾ hours at a big air base in the southwest; 750,000 sq.yd. in 42 processing days. (Arizona Constructors; I. G. Beall, subcontractor).

●

19,333 sq.yd. processed in 29-hour period at a Pennsylvania airport. 102,300 sq.yd. of runways and taxiways in equivalent of eight 24-hour working days (D. W. Winkelman).

●

25,668 sq.yd. peak day, total of 403,827 sq.yd. in 35 processing days at midwestern base. (Sollitt, Lancaster, White Corp.).

●

18,875 sq.yd. in single day of 19 hours with one double crew at a southeastern field, 12-14,000 yards on many days (Hardaway Contracting Co.).

Eighteen to 35,000 square yards a day . . . a mile of runway in three 15-hr. working days . . . a 750,000 square yard airport paving job completed in 42 processing days . . . such speeds are not only possible, *they're being accomplished* with soil-cement.

But soil-cement offers vital advantages other than speed for light traffic pavement.

Soil-cement field and laboratory control methods *assure* pavement of all-weather serviceability.

Soil-cement is about 90% soil and therefore saves on material haulage.

Soil-cement is easily placed with simple equipment and ordinary labor.

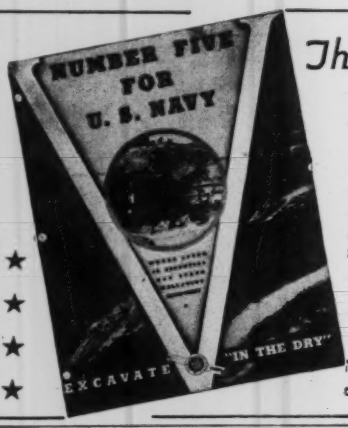
Over 15,000,000 sq. yards of soil-cement is in service or being built at the nation's airports. Soil-cement is ideal for light-traffic roads and streets, auxiliary and secondary runways; plane parking areas and taxiways; parking areas for army trucks and war workers' cars; road shoulders and widening.

Call on our engineers for design and construction assistance on your soil-cement projects. Write for booklet on salvaging old pavements with soil-cement. Mailed free in U. S. or Canada.

PORTLAND CEMENT ASSOCIATION, Dept. A3d-17, 33 W. Grand Ave., Chicago, Ill.

A national organization to improve and extend the uses of concrete . . . through scientific research and engineering field work

BUY MORE WAR SAVINGS STAMPS AND BONDS



The WELLPOINT INDUSTRY

has made its contribution to the war effort. Read about it in this Victory Bulletin—yours for the asking. The bulletin tells by word and picture how wet excavation is converted to dry excavation, saving sheeting and cofferdams. On small or large projects, Wellpoint equipment assures speed and economy during excavating and subsequent operations.

FOR SALE OR RENT

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GLUE & PLASTERBOARD PERFORM NEW KAISER MIRACLE AT VANPORT

RIGHT: *Brushing Laucks Construction Glue on studding before applying Wallboard.* **LEFT:** *Frank Stepanek, "expediter" of glue and plasterboard walls, for world's largest housing project.*

THAT 4-DAY SHIP that Kaiser built is no greater speed miracle than the 10,000-unit housing project for the Kaiser shipyard workers . . . where glue and plasterboard formed a new dry-wall partnership to speed this world's largest housing job.*

Working with Laucks glue specialists and U. S. Gypsum Co., Frank Stepanek, sub-contractor in charge of this work, developed the technique of applying USG's predecorated Sheetrock for walls. By *using Laucks Construction Glue in place of nails* he was able to erect completely finished walls quickly, economically, without defacing the surface . . . saving critical steel nails at the rate of 17,500 lbs. per 5 million sq. ft. of plasterboard!

**Wolff and Phillips, Architects.*

Perhaps Laucks glue knowledge can help *you* . . . whether it's arches, beams, prefabricated houses, or something else you're building. Our 20 years' experience provide us with the "know how" to guarantee the right use of the right glue. (Wire, write or phone if you're interested in facts and figures on this Vanport job.)

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● Don't forget, LAUX REZ, the pioneer resin sealer and primer, protects wood as rust-proofing protects metal.

WOOD & GLUE RELEASE STEEL FOR WAR

LAUCKS CONSTRUCTION GLUES

Consult LAUCKS—America's Glue Headquarters

MANUFACTURERS' ACTIVITIES

ANDREW H. PHELPS, vice-president in charge of purchases and traffic for the Westinghouse Electric & Mfg. Co., recently received the Westinghouse Order of Merit Medal for exceptional service to the electrical industry and his company in wartime. The Order of Merit Medal, a silver W on a bronze background, was presented to Mr. Phelps by George H. Bucher, president of Westinghouse, during a ceremony held at the East Pittsburgh Works with 2,500 company officials and employees present.

FREDERICK SANDITT, vice-president of the Harnischfeger Corp., Milwaukee, has been elected to the board of directors to succeed the late Joseph Harnischfeger. H. H. Erkelenz, executive engineer and coordinator at Harnischfeger, H. O. Menck and William F. Heilmann, works manager, have been elected vice-presidents. William F. Heilmann, formerly assistant secretary, has been made secretary, and Fred J. Hartmann, has been appointed assistant secretary in addition to his duties as assistant treasurer.

GEORGE F. HILL, service engineer for the Allis-Chalmers Mfg. Co., has been appointed a captain in the Corps of Engineers. He is a graduate of Purdue and for several years did engineering work in Guatemala.

L. E. HARKRIDER has been elected vice-president of the Heinn-Werner Motor Parts Corp., Waukesha, Wis., and also made a director to succeed the late Dr. M. A. Hadcock. Howard Mullin also has been elected a director to succeed Marshall Arnold, who resigned.

VIRGIL L. SNOW, assistant chief engineer, of the Euclid Road Machinery

BAILEY METERS AND CONTROLLERS

FOR SEWAGE TREATMENT AND WATER SUPPLY . . .

● Venturi Tubes, Weirs, Flumes, Nozzles and other primary elements; Mechanically and Electrically operated Registers and Complete Automatic Control Systems.

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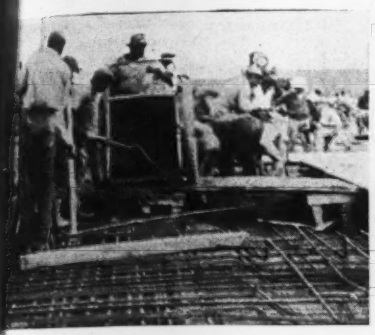
Bailey Meter Co. Ltd., Montreal, Canada

Trowel 35-minute-old concrete?

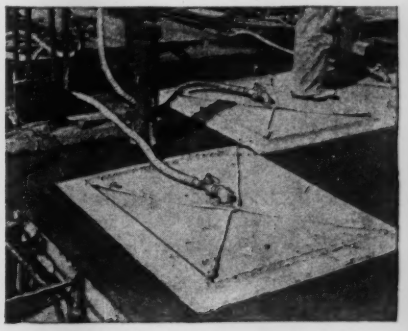
you CAN . . . with VACUUM

Imagine 8-inch slump concrete emerging hard enough to walk on and ready for the finishers to start troweling only 10 to 15 minutes after screeding . . . and after only 4 or 5 minutes under Vacuum Concrete Process mats! Because Vacuum makes such speed possible, leading contractors from coast to coast are using it on job after job . . . to rush important war construction . . . cut their costs . . . and meet rigid government specifications. Here's how it works:

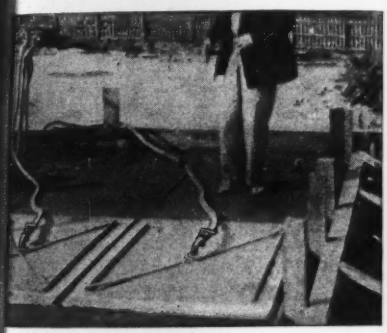


8:00 Placing of concrete in the slab is begun.

8:20 End of slab is concreted and screeding is started.



8:28 First Vacuum Process mats are placed and vacuum applied, drawing out entrapped air and excess water.



8:33 Concrete is now hard enough to stand on without imprint! Mats are moved ahead.

8:35 Cement finishers start floating and troweling. Hours of costly finishing time have been gained.

Only the VACUUM PROCESS gives you all these ADVANTAGES:

Cement finisher production is increased . . . overtime drastically slashed or completely eliminated—even with longer pours.

●

Forms may be stripped in 3 or 4 days . . . 28-day strength is usually obtained in 3 days when Vacuum is used.

●

Wetter mixes, providing easier placing, can be used when excess water is subsequently removed by Vacuum processing.

●

Approximately 50% greater ultimate strength is obtained without using a richer mix . . . due to lowered water-cement ratio and compaction of concrete.

●

Removal of water and entrapped air produces smooth, void-free wall and ceiling surfaces . . . reduces pointing . . . makes possible high-grade monolithic finishes without dust-on mixtures or driers.

Vacuum Concrete Process equipment is furnished on a rental basis . . . for use in any part of the country. For details, write for folder: *"Speed and Economy for the Contractor"*.

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Write for name and address of our representative nearest you

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FOR SPEED AND ECONOMY plus GREATER STRENGTH

"BIG INCH" BRIDLED BY LUDLOW

Up from Texas, 300,000 barrels of "galloping petroleum" will reach Illinois daily on its way to Eastern refineries. The world's biggest oil pipeline—"Big Inch"—will carry this mighty flow of oil. To control and direct it, the world's most dependable valves were specified—rugged, efficient Ludlow Valves. Built for service far into the future, Ludlow Valves will assure the smooth, trouble-free performance that has made them the first choice in the toughest of assignments. Let Ludlow give you value in valves. Send for Catalog.

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Construction features: Self-releasing 30° angle wedges and free-floating gates, self-adjusting to seats, afford smooth action, tight closure, long service regardless of frequency of use. Rings cleaned throughout stroke action. Gates are wedge-locked directly opposite ports and completely unwedged before raising. Ample tolerances provide free movement. Simple construction permits easy replacement of parts.

LUDLOW VALVES

SINCE 1866 PV9

Co., Cleveland, Ohio, has been assigned to new duties in the industrial field. As industrial engineer, Mr. Snow will work with mining companies, quarries and other industrial concerns in the application, design and maintenance of Euclid equipment. Mr. Snow is well known in the heavy duty automotive and engineering fields.

WHITING CORP., Harvey, Ill., has announced that the headquarters of its Canadian subsidiary, Whiting Corp. (Canada) Ltd., has been moved to 45 Richmond St., West, Toronto, where its newly elected vice-president and general manager, H. M. Rowlette, will be in active charge of the Canadian business. He succeeds Col. James Mess, now devoting full time to government duties at Ottawa.

CARL W. LEMMERMAN, West Hartford, Conn., formerly vice-president of the Homestead Corp., has been elected president of the company and its subsidiaries, the Hartford Cement Co., the Windsor Cement Co., and the Homestead Insulation Co.

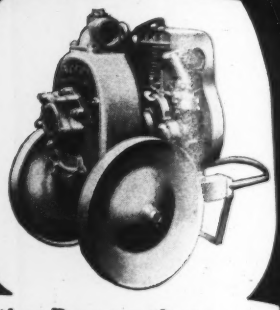
MORE THAN 15,500,000 lbs. of scrap metal and other materials have been collected for the government by the Reo factory at Lansing, Mich., exclusive of the amount accumulated by Reo branches, distributors and dealers throughout the United States. Since May, 1942, a special committee of Reo executives has been active in promoting scrap collection.

CHARLES H. MANION, vice-president in charge of operations of the Follansbee Steel Corp., Follansbee, W. Va., has been elected a director. Mr. Manion joined the company in 1919 as a designer.

THREE HUNDRED and sixty-two freight cars and five hundred and thirty-nine trucks, loaded to the top with vital scrap materials, were shipped out of the General Motors Truck and Coach factories at Pontiac, Mich., last year. According to I. B. Babcock, president, the truck company broke all salvage records in 1942, collecting a total of 43,553,210 pounds of materials which were turned back into scrap processing channels. This was 47 percent more than in any previous year.

HARRY R. MEYER has been appointed general manager of sales for By-Products Steel Corp. Mr. Meyer was formerly manager of direct sales for Lukens Steel Co., of which By-Products Steel is a subsidiary. Mr. Meyer was born in Philadelphia in 1901 and has spent all of his business career with Lukens.

JAEGER "SURE PRIME"



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with up to 5 times faster priming, with hi-head, hi-capacity performance, with thousands of extra hours of trouble-free service.

Self-cleaning design, replaceable liners, longest life seal, heavy duty construction thruout.

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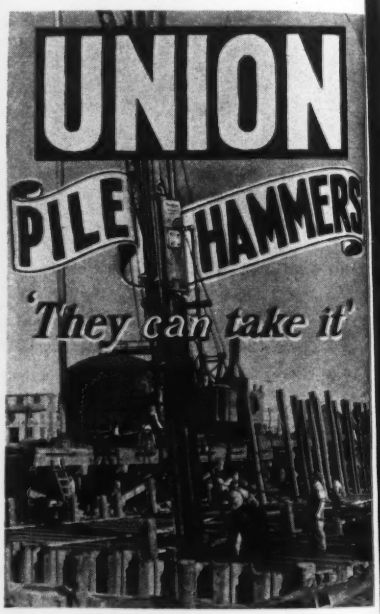

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The New System of

WOOD STRUCTURAL FRAMING

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HAVE YOU CONSIDERED THESE ADVANTAGES?

AVAILABILITY . . Timbeam is made from materials readily available.

ADAPTABLE to almost any place structural steel is used.

ECONOMY—STRENGTH . . Reduces dead load of the beams and columns up to 50%, with equivalent strength of steel or solid wood members.

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With steel on the extreme critical list and structural timbers increasingly difficult to obtain, the use of TIMBEAM becomes urgent as an alternate for these materials. That is why it is meeting with a rapidly growing demand.

MADE OF STANDARD PLYWOOD and STANDARD DIMENSION LUMBER

TIMBEAM is an I-shaped Wood Fabrication constructed of plywood and lumber. It is used as WOOD PLATE GIRDERS, BEAMS, PURLINS, JOISTS and COLUMNS and will span long distances. It is built upon accepted engineering principles to attain maximum strength and economy. In most cases, TIMBEAM will save 50% of the usual amount of solid rectangular sections. It is WPB approved and is recognized as a distinct engineering advancement. Prompt shipment. WRITE FOR CATALOG.

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"Technical Progress" of **direct fired warm air heating**

IS REPORTED IN THESE THREE PAPERS*

...may we place them on your desk?

THESE PAPERS contain interesting technical detail on the functioning of direct-fired self-contained warm air heaters which will be valuable to those who are responsible for the heating of service buildings, industrial plants and other large structures.

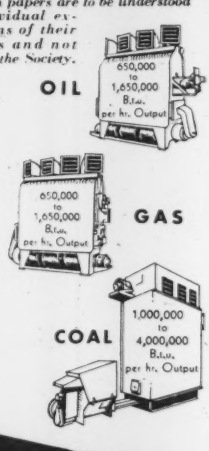
Development and Performance of a Coal-Fired Unit Heater
Presented at the Annual Meeting, New York, N. Y., November 30-December 4, 1942, of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS.

Design and Performance of a Direct-Fired Unit Heater
Reprinted from *Heating, Piping & Air-Conditioning* magazine, January 1942.

Heating Industrial Buildings with Direct-Fired Units
Reprinted from *Engineering News-Record.*

A request will bring them to you by return mail.

*Note: *Statements and opinions advanced in papers are to be understood as individual expressions of their authors and not those of the Society.*



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DRAVO BUILDING PITTSBURGH, PA.
55 Sales Offices in Principal Cities

DRAVO DIRECT FIRED HEATERS

Aero-Filter Design Data—The Lakeside Engineering Corp. has issued three new pieces of literature, "Aero-Filter Design Data," "Aero-Filter Results, Predictions and Performances," and a bulletin announcing the "Clari-Filter—A New Type of Contact Filter." This literature is addressed to those engineers doing sewage treatment design and sewage treatment plant engineers. Each booklet is profusely illustrated with detail drawings and such technical information as to be of exceptional value to those to whom it is addressed. Any one or all of the three pieces of literature will be gladly sent upon request by addressing—*Lakeside Engineering Corp., 222 W. Adams St., Chicago, Ill.*

Portable Pipe Bender—A 4-page pamphlet describing Tal's Prestal hydraulic portable pipe benders. This is an economical labor and material saving device, according to the manufacturers, and those interested in complete details will find the information in this piece of literature of interest—*Tal's Prestal Bender, Inc., Milwaukee, Wis.*

Dryers—This 36-page bulletin discusses the fundamentals and various methods of drying the many classes of raw materials. It describes in detail the construction, application and operation of six types of "Ruggles-Coles" rotary dryers—the double shell indirect heat dryer, the double shell direct heat dryer, the rotary steam tube dryer, the single shell direct heat dryer, the parallel flow

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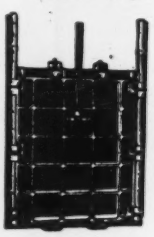

SLUICE GATES
Also flap and mud valves, shear and filler gates. Dependable equipment since 1840.
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…t dryer and the single shell hot air …r. For further information ask for …letin 16-C—*Hardinge Co., Inc., York,*

…e Welding of Piping"—A practical …tise of 16 well-illustrated pages … comprehensively covers various …s of ferrous and non-ferrous piping, …r dimensions, fabrication, and esti…es the welding and labor costs has …n issued by—*Air Reduction Co., 60 …2nd St., New York, N. Y.*

…i-rust compounds—Useful informa… for the man who worries about rust …contained in a folder descriptive of …i-rust compounds, especially adapted … use on machine parts, castings, …mpings, fabrications, assemblies, for …pment or storage.—*Black Bear Co., …, Long Island City, N. Y.*

…ater-Wash spray booth—Equipment …t can be used for every industrial …aning operation is described in a new …strated folder issued by—*Meyer …g. Corp., 51 Division Place, Brooklyn, … Y.*

…ate Lifting Clamps—A handy little …lder explaining that the "Volz" plate …ting clamp is engineered specifically … lifting heavy weights. It is claimed …at the grip is instantaneous and posi…e.—*Merrill Brothers 56-02 Arnold …e., Maspeth, N. Y.*

…aminated Arches and Beams—A con…truction which has come into promin…ce during wartime scarcity of steel is …re presented by the organization which …ioneered it. This 12-page catalog …lustrates the successful use of glued …aminated construction over an eight…ear period, in buildings covering an …rea of more than 5,000,000 sq. ft. Prac…ically every conceivable shape and type …f arch and beam, and practically every …asic type of installation is shown, with …hotographs, drawings and suggestions …r its practical application.— *Unit Struc…ures, Inc., Peshtigo, Wis.*

Another New Bridge with Operating Machinery by...

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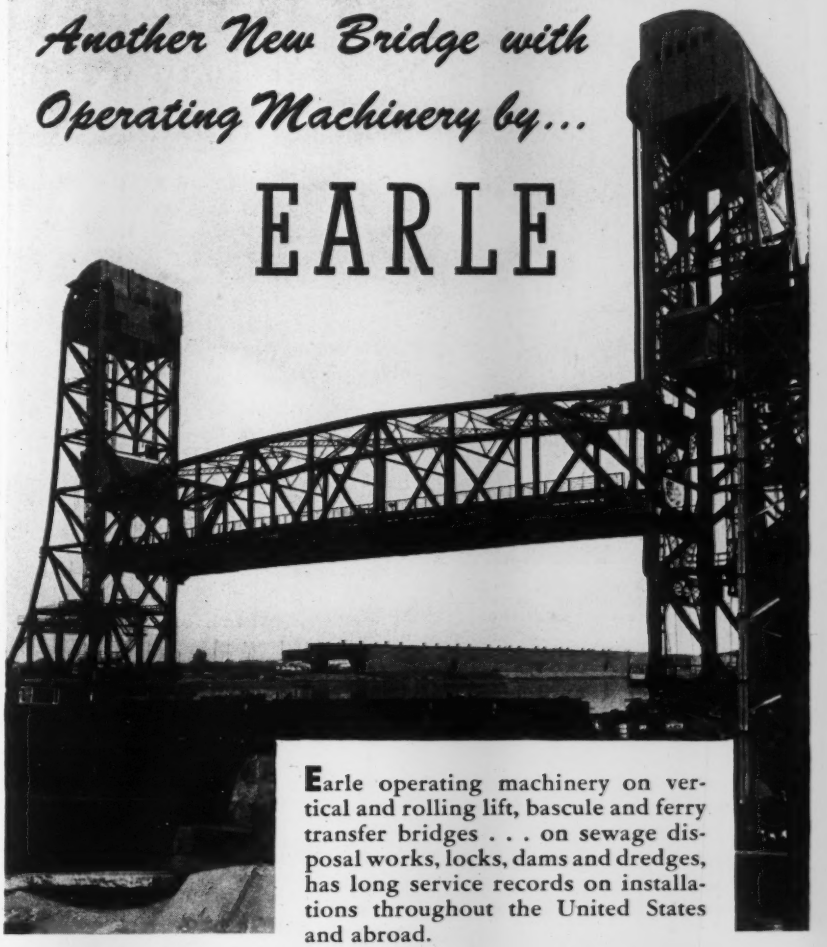

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WADDELL & HARDESTY
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THE PHOENIX BRIDGE CO., INC.
General Contractors

Earle operating machinery on vertical and rolling lift, bascule and ferry transfer bridges . . . on sewage disposal works, locks, dams and dredges, has long service records on installations throughout the United States and abroad.

Send for the Earle booklet 42-B. It illustrates and describes a number of Earle bridge operating machinery installations.

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Wood Preservers Since 1878
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STERLING PUMPS
YOU'LL GET BETTER RESULTS WITH STERLING
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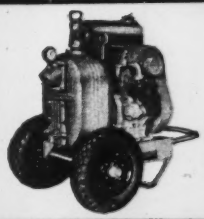

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Above picture shows a 6 cu. yd. Sauerman Scraper operating on a 450-ft. radius handling a 200,000-ton stockpile. Hourly capacity, either storing or reclaiming, is 200 tons.

Here is a Sauerman Scraper equipped with carrier for gravity return, moving gravel from deep cut to crusher at screening plant.

HOW TO CUT COSTS
of Your Long Range Material Handling Jobs

A bottomless Sauerman Crescent Scraper bucket hauled back and forth by wire cables—loading and dumping automatically—offers the cheapest way to handle earth and bulk materials on many jobs where there is a haul of 100 ft. or more. Thousands of engineers and contractors recognize this fact and use Sauerman Power Scrapers for their long range work.

The first cost of a Sauerman Power Scraper is reasonable. The machine is easy to operate; any workman can learn to run it satisfactorily with very little practice. The power cost and also the maintenance expense are exceedingly low per cubic yard of material handled. Wearing parts are few and are easily accessible for inspection or repair.

Write for catalog

SAUERMAN BROS., Inc.

532 S. Clinton St. Chicago, Illinois

SCRAPER AND CABLEWAY ENGINEERS & MANUFACTURERS SINCE 1909

MEETINGS

ARKANSAS ENGINEERS C[LUB], in joint ses[sion] with Little Rock [Engineers Club], Mid-South Section, Amer[ican Society of] Civil Engineers, and Ark[ansas Society of] Registered Professional [Engineers, Little] Rock, Ark., March 26–27.

TEXAS SECTION, AMERICAN SOCIETY [OF] CIVIL ENGINEERS, semi-annual meeting, Dallas, Texas, April 6-8.

AMERICAN ROAD BUILDERS ASSOCIATION annual meeting, Edgewater Beach Hotel, Chicago, Ill., May 5-7.

PACIFIC-NORTHWEST SECTION, AMERICAN WATER WORKS ASSOCIATION, Bellingham, Wash., May 7–8.

Elections and Activities

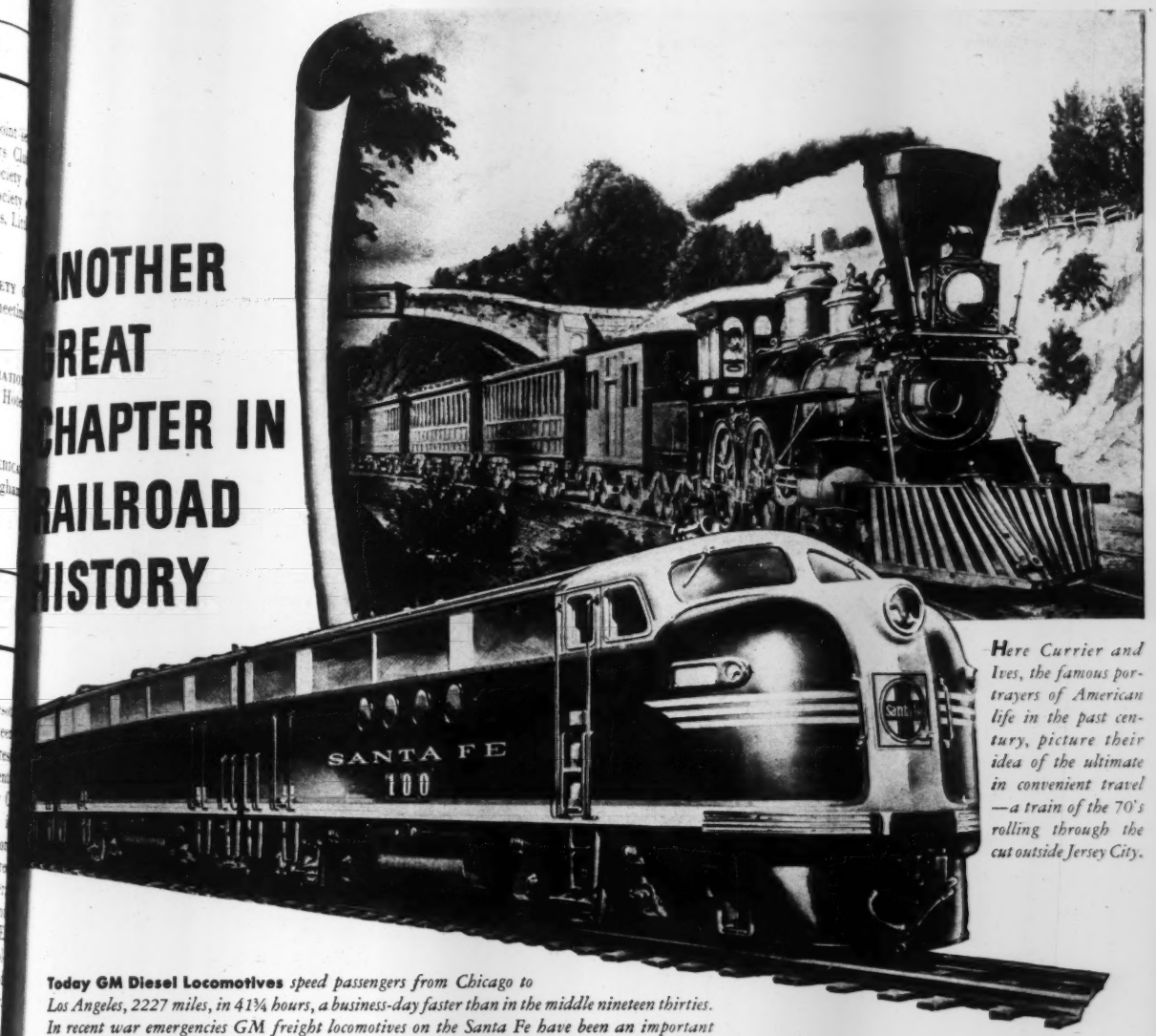
NEW STATE OFFICERS of the Minnesota Association of Professional Engineers are Edwin S. Rankin, Brainerd, president; N. T. Rykken, vice president; Sidney L. Stolte, secretary; and Ray C. Deegan, treasurer. R. R. Herrmann, president for the current year. Councilors elected to the executive council for three years are Mark G. Brataas, of Rochester; Charles E. Doell, of Minneapolis, and John F. O'Meara, of Windom; Harold E. Chard, of St. Paul; Theodore A. Podoske, of Alexandria, for two years; and James G. Waits, of Duluth, for one year.

L. J. WRIGHT, assistant engineer of Skagit County, Mount Vernon, Wash., has been elected president of the Washington State Society of Professional Engineers.

THE MASTER BUILDERS ASSOCIATION of Wisconsin elected the following officers recently: President, Ambrose H. Peters; secretary, Richard C. Ferge; treasurer, John Gysbers; trustee, August Kratochbel; Eastern district chairman, Walter Forke; Southern district chairman, Ralph Karnes, and Northern district chairman, Joe W. Hoida.

AT THE ANNUAL MEETING of the Building Congress of Wisconsin on Feb. 12, the following directors were elected: J. C. Staff, of the Electrical Contractors Association; W. H. Oleson, of the Heating and Piping Contractors Association; P. Schoeman, of the Milwaukee Construction Trades Council; E. J. Endlich, of the Master Builders Association; W. G. Meumler, State Association of Wis-

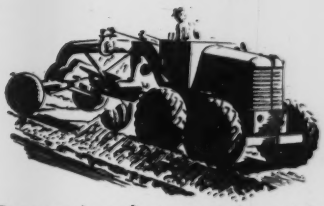
ANOTHER GREAT CHAPTER IN RAILROAD HISTORY



Here Currier and Ives, the famous portrayers of American life in the past century, picture their idea of the ultimate in convenient travel —a train of the 70's rolling through the cut outside Jersey City.

Today GM Diesel Locomotives *speed passengers from Chicago to Los Angeles, 2227 miles, in 41¾ hours, a business-day faster than in the middle nineteen thirties. In recent war emergencies GM freight locomotives on the Santa Fe have been an important factor in the rapid movement of precious war material between Chicago and the Pacific Coast.*

THE history of America is a history of progress in transportation. ★ This history is not completed. ★ General Motors locomotives have turned a new page in this record of progress. ★ The flowering of this new era when peace again returns is foretold in the tremendous strides already taken in meeting the challenges of war today.



Reconstruction and new construction are going to need plenty of this hard-hitting, easy-on-the-fuel power. With normal refinement and development speeded up by war, with production expanded, GM Diesels will be ready to serve in more fields and in more ways than ever.

GM
GENERAL MOTORS
DIESEL POWER

LOCOMOTIVES.....ELECTRO-MOTIVE DIVISION, La Grange, Ill.

ENGINES..300 to 2000 H.P...CLEVELAND DIESEL ENGINE DIVISION, Cleveland, Ohio

ENGINES.....15 to 250 H.P.....DETROIT DIESEL ENGINE DIVISION, Detroit, Mich.

. . . If you want to make speed profitably . . . GET DEPENDABLE EQUIPMENT . . Buy the Fast . . .

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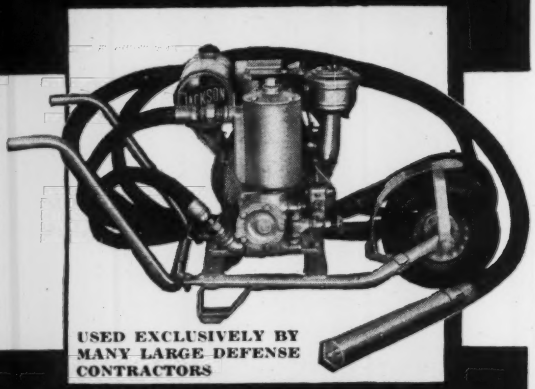
DESIGNED TO "TAKE IT" 3 SHIFTS A DAY—EVERY DAY

- Automatic pressure lubrication—requires no attention.
- 34-ft. hose—2¾" vibrator head.
- Adjustable frequency to 6800 R.P.M.—submerged in concrete.
- Powerful gas engine—4.7 H.P.
- Long-lived, ball-bearing, rotary, hydraulic pump.



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our boat - building facilities are 100% government.

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Our foundation and dredging facilities are still available for commercial use.

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consin Architects; J. [illegible] Gebhard, [illegible] eral Contractors Asso[illegible]tion; R. Le[illegible] Millwork Bureau, Inc.; W. G. Tru[illegible] Milwaukee Real Esta[illegible] Board; W[illegible] Dortsch, of the Produc[illegible]s Council [illegible] of Wisconsin.

THE WISCONSIN CO[illegible]TRUCTORS [illegible] elected the following offi[illegible]ers at their [illegible] nual convention held Fe[illegible] 4-5: Presid[illegible] T. S. Willis of Janesville; vice-presid[illegible] J. J. Thiele, of Allen Grove; second v[illegible] president, Nick Schmitz, of Madi[illegible] secretary-treasurer, Frank A. Thew, [illegible] Oshkosh; executive-secretary, J. H[illegible] Green, Janesville; directors, Mark [illegible] Cullen, R. W. Kivell, Edward J. Ho[illegible] ner, James Harbridge and Nick Schm[illegible]

THE WISCONSIN CHAPTER of the A[illegible] ciated General Contractors of Ame[illegible] elected the following officers on F[illegible] 4-5: President, George F. Hutter, F[illegible] du Lac; vice-president, Milton B. F[illegible] dorff, of Madison; secretary-treasu[illegible] Edward F. Nelson, of Oshkosh; exe[illegible] tive secretary, J. Harry Greene of Jan[illegible] ville; directors, R. W. Kivell, Mark [illegible] Cullen and Edward J. Hoeppner.

R. S. EADIE, assistant chief engineer [illegible] the Dominion Bridge Co. Ltd., Montre[illegible] Canada, is the newly elected chairm[illegible] of the Montreal Branch of the Engine[illegible] ing Institute of Canada. Mr. Eadie w[illegible] graduated from McGill University [illegible] 1921.

W. P. PAYNTER has been elected pre[illegible] dent of the Kentucky Association [illegible] Highway Contractors for the year 194[illegible] W. B. Humble was renamed as executi[illegible] secretary.

WAYNE T. SWITZER has been elect[illegible] president of the County Engineers As[illegible] ciation of California. Albert F. Parrott [illegible] vice president; Howard L. Way [illegible] elected secretary.

THE MILWAUKEE CHAPTER of A.G.C. [illegible] elected the following directors at the [illegible] annual meeting Feb. 26: T. L. Cottam, [illegible] H. F. Mielenz, Walter T. Buchholz, A[illegible] thur C. Wolff and Al Maier.

WADE H. GALLANT was elected pre[illegible] dent of the Raleigh, N. C., Engineer[illegible] Club at a meeting held March 1. H. [illegible] Wilson was elected vice-president an[illegible] LeRoy M. Keever was re-elected secr[illegible] tary-treasurer.

R. E. BRAGSTAD, Sioux Falls city engi[illegible] neer, has been elected president of th[illegible] South Dakota Society of Engineers an[illegible] Architects. Other officers elected include [illegible] W. H. Gamble, vice-president; and H. V[illegible] Pierce, secretary-treasurer. All of las[illegible] year's officers are in the armed service[illegible] or engaged in wartime construction work[illegible]

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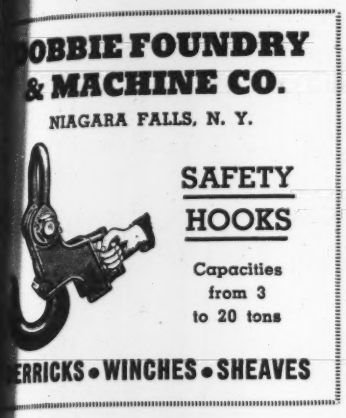

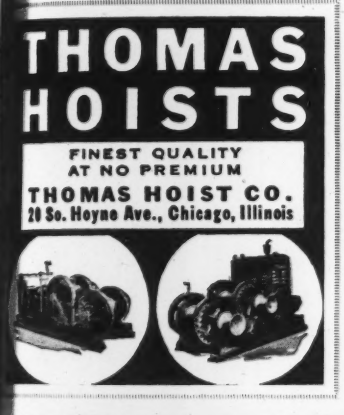

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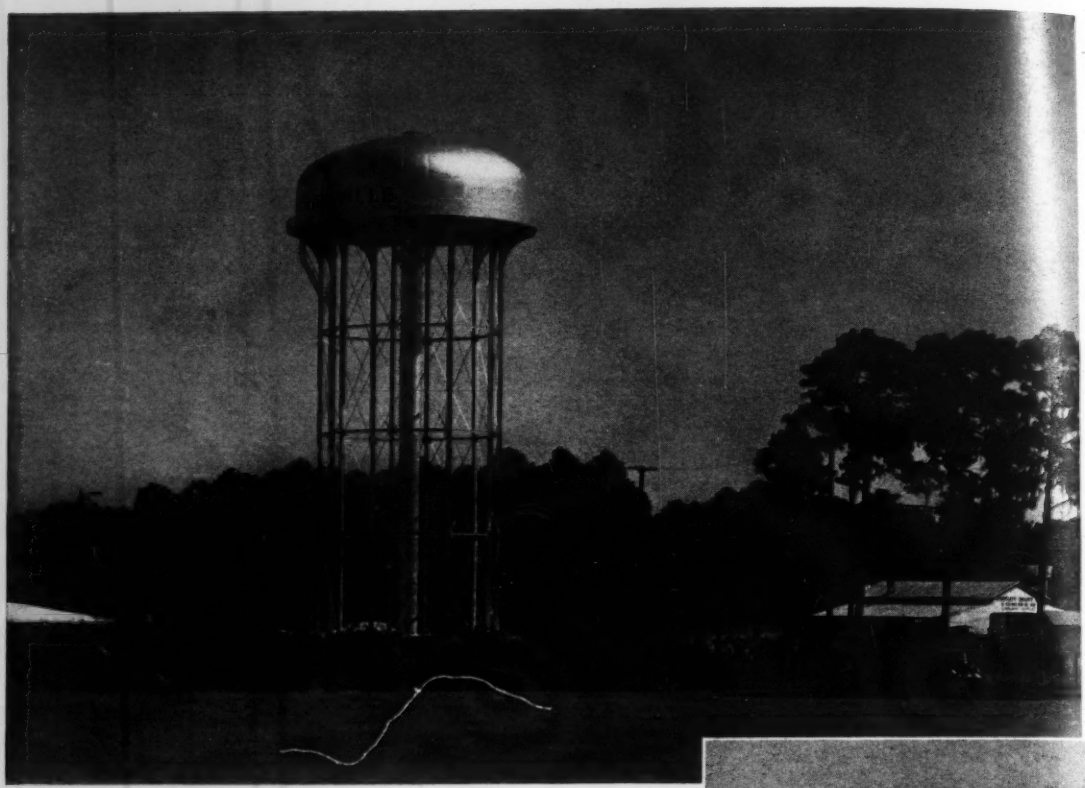

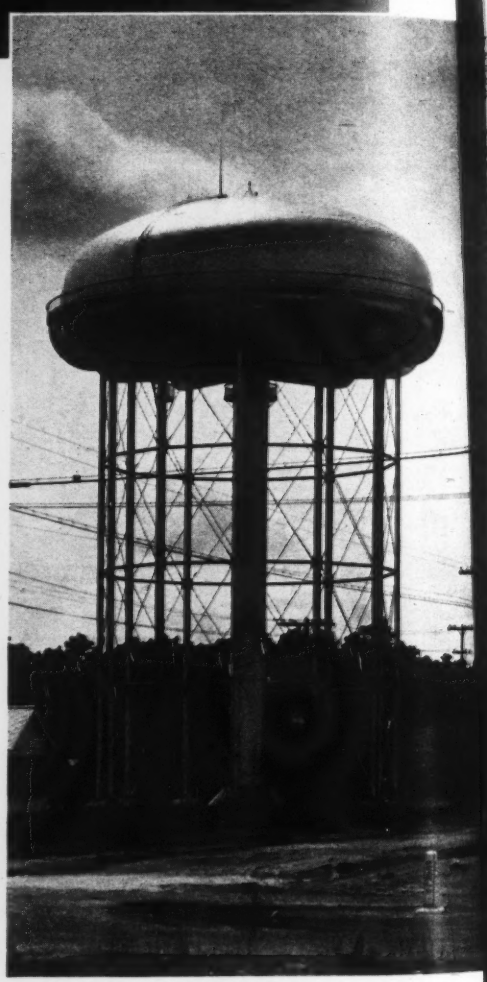

ELEVATED TANKS reduce pumping and increase pressures at JACKSONVILLE

Philip Hauser, Bureau of Census, recently prepared an interesting treatise on probable post-war population shifts. Municipal Engineers will not be surprised to find in Class A-1—*those which grew most rapidly during the war with the best prospects of retaining their wartime growth*—cities that have large storage tanks in their waterworks systems. Jacksonville, Fla., is in that classification and the two radial-cone tanks shown here are helping meet peak water demands *now* which, at the moment, is more important and comforting to the local waterworks officials than the service they will render in the future to the wartime growth the city retains.

The two Jacksonville tanks were installed as a part of a complete modernization program completed in 1940. One, the 500,000-gal. unit shown above, is located at the River Oaks substation. This section now has adequate water pressure all the time where previously two-story dwellings could not be served during lawn sprinkling. In addition, the storage in this tank has reduced the pumping hours at the main pumping station.

The other tank, the 1,000,000-gal. structure at the right, has boosted pressures and improved service in the northeast part of the distribution system.

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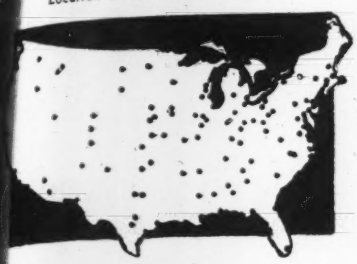
CONSTRUCTION REPORTS

Compiled by Business News Department—Engineering News-Record, 330 W. 42nd St., New York
ELSIE EAVES, Manager *SCOTT McLEOD, Statistician*
(Daily service also available—Write for details)

Location of ENR Correspondents



Symbols and Abbreviations Include

Federal Government
Project of $500,000 or over
ENR Engineering News-Record
ED Engineering News-Record Construction Daily

Projects—By Size

nstruction projects here reported cover the ited States and Canada, are of these mini- m sizes or larger: water supply, earthwork, terworks, $15,000; other public works, $25,- 0; industrial buildings, $40,000; other build- gs, $150,000.

Classes of Construction

(Named in order of Listing)

ater Supply — Unclassified
wers, Waste Disposal — Latin America
idges, Grade Cross'gs — Public Buildings
reets & Roads — Commercial Buildings
rthwork, Waterways — Industrial Buildings

Stages Reported

ROPOSED: (except Streets & Roads):

IDS ASKED (new announcements only. For ll calendar, see also preceding issues of ENR);

OW BIDDERS: On jobs below $500,000 value ll low bidder news will be the final reports ublished on the projects involved except here award is not made to the low bidder. n this case, a supplementary contract award eport will be published.

ONTRACTS AWARDED: Except awards to ow bidders previously reported in low bidder tage.

Dates shown are of issue in which last previous report was published.

Note: To comply with censorship requirements, addresses on some reports are being generalized. Data which would reveal the purpose of the improvements and the size are withheld. The name of contractor and general area are reported.

WATER SUPPLY

PROPOSED WORK

★**†Fla., Miami**—City, imprv. water transmission gridiron, consisting running 42 in. main from Hialeah pump. plant along N.W. 67 St. 10 Ave. and 30 in. main from there to storage tanks at 36 St., imprv. 2 auxiliary pump. stations. $730,000. **FWA.** CD 3/16—ENR 3/18.

†Ind., Fort Wayne—Bd. P. Wks., R. G. Beams, chn., City Hall, bids soon 18,000 ft. 12- to 24-in. c.i. watermain, Clay, Hanna and Wayne Sts. $177,712. **FWA.** C. R. McAnlis, city engr.

†N. C., Creedmoor—Federal Works Agency, 601 State Planters Bank Bldg., Richmond, Va., dam, NC 31-223. $68,000. W. F. Freeman, High Point, engr. CD 3/12—ENR 3/18.

†Tex., Bonham—R. T. Lipscomb, city atty., WW. Proj. Tex. 41-570, $25,800. **FWA.** Freese & Nichols, Capps Bldg., Fort Worth, engrs. CD 3/17.

Tex., Gainesville—Drilling and developing 2 water supply wells. Over $15,000. Freese & Nichols, Capps Bldg., Ft. Worth, engrs.

Tex., Port Isabel—B. B. Burnell, mayor, water sys. $15,137. Applied for FWA funds. Tamm & Fitzgerald, 109 S. 1 St., Harlingen, engrs.

Tex., Sherman—City, surveying toward municipal ownership of existing waterworks and imprv. sys. Over $15,000.

★**Que., Montreal**—Municipality, filtration beds for WW to accommodate 50 m.g. d.c. $508,000. J. J. A. Jette, Hydro-Electric Bureau, City Hall, engr.

BIDS ASKED

Bids Asked March 29

N. Y., New York—Comr. Water Supply, Gas & Electricity, Municipal Bldg., dismantling, repairing, relaying existing 12 in. steel water pipe on Queensboro Bridge between Piers 1 and 2, Manhattan Boro.

Bids Asked in April

†Md., Towson—Comrs. Towson Co., Court House, 1 story, brick pump. sta. at Lodge Forrest, for Baltimore County Metropolitan Dist. **FWA.** G. W. Stephens, Jr., Courthouse, Towson, engr. R. T. Register, Baltimore Life Bldg., Baltimore, consult. engr.

Bids Asked April 1

†Va., Cape Charles—Federal Works Agency, at City Hall, addnl. WW facilities, incl. development field of 16 to 20 shallow wells, 2 in. bore, installing pump. equip., 3,700 ft. 6 in. c.i. distr. lines, Va. 44-260. $30,300. R. Stuart Royer Builders Exchange, Richmond, engr. CD 10/16—ENR 10/29.

Bids Asked April 2

Conn., Bristol — Bd. Water Comrs., 119 Riverside Ave., watermains. $90,300. Metcalf & Eddy, 20 Providence St., Boston, Mass., engrs.

LOW BIDDERS

†Conn., Bristol—Federal Works Agency, 2 Lafayette St., New York, N. Y., Mar. 12, materials for water supply, from Warren Pipe Co. of Mass., Inc., 75 Federal St., Boston, Mass., **$30,296.**

CONTRACTS AWARDED

†Alabama—U. S. Eng., 494 Spring St. N.W., Atlanta, Ga., construction, completion addnl. water supply and fire protection facilities, Calhoun Co., to T. H. Pearce & Co., Edgewood Circle, Columbus, Ga., under **$50,000.**

†Arkansas—U. S. Eng., 300 Broadway, Little Rock, water sys. Pulaski Co., to Mid-West Const. Co., Sioux City, Ia., under **$100,000.**

†Florida—U. S. Eng., U. S. Courthouse & Post Office, Jacksonville, water supply reservoir and rehabilitating water treatment plant, Volusia Co., to Murphy Const. Co., Clare Ave., West Palm Beach, **$50,000-$100,000.** Awarded 3/11.

†Florida—U. S. Eng., U. S. Courthouse & Post Office, Jacksonville, water and sewerage sys., Clay Co., to J. B. Green Plumbing & Equipment Co., Sarasota, under **$50,000.** Awarded 3/3.

†Florida—U. S. Eng., U. S. Courthouse & Post Office, Jacksonville, water distr. and sewage collection sys., Neg-D.F.-43-36, Hillsborough Co., to J. B. Owens, 4011 First Ave. N., Birmingham, Ala., under **$50,000.** Awarded 3/3.

†Florida—U. S. Eng., U. S. Courthouse & Post Office, Jacksonville, water distr., sewage collection and disposal sys., Pinellas Co., to Boyce Co., Clearwater, under **$50,000.**

†Georgia—U. S. Eng., 494 Spring St. N.W., Atlanta, water line, constructing addnl. booster station and installing new pump in existing station, Catoosa Co., to City Water Co., 126 E. 10 St., Chattanooga, Tenn., under **$50,000.**

Mich., Inkster—Village, c.i. water mains, etc., to Coulter Bros., 19192 Strasburg St., Detroit, **$32,274.** Bids 3/10. CD 3/4.

†Texas—U. S. Eng., Fort Sam Houston, water chlorination sta., Bell Co., to Hagstrom Constr. Co., Professional Bldg., Temple, under **$50,000.**

†Texas—U. S. Eng., Fort Sam Houston, supplemental contract waterworks and sewerage sys., Coryell Co., to Parrott & Oldt, 310 Haskell St., Dallas, under **$50,000.**

†Texas—U. S. Eng., 231 W. Main St., Denison, elevated tank and tower, Smith Co., to H. E. White, Tyler, under **$50,000.** Awarded 3/18. CD 3/16—ENR 3/18.

SEWERS, WASTE DISPOSAL

PROPOSED WORK

Conn., East Hartford (br. Hartford)—Town, Street Dpt., 740 Main St., preliminary plans storm sewers Knollwood Rd., Forest and Fairfield Sts. $34,373.

Conn., Bridgeport—City, Dpt. P. Wks., City Hall, storm and sanitary sewers, Everett St., Garden Dr., Rosewood Place, Huntington Turnpike and on private property to Brook. $25,000, Henry L. Rowland, City Hall, engr.

†Ga., Rossville—Pub. Bldgs. Admin., North Interior Bldg., Wash., D. C., received no bids Mar. 12, storm sewers, etc. CD 3/1—ENR 3/4.

†Kan., Kansas City—Fairfax Drainage Dist., 721 Minn. St., Kansas City, Kan., storm sewer. Proj. Kans. 14-242. $36,780. **FWA.** CD 2/17—ENR 3/4.

Mo., Dixon—Sewerage sys., $30,000. Applied for FWA funds.

Mo., O'Fallon—City, completing sewers. $37,235. Applied for FWA funds.

Mo., Springfield—Completing sewers. $144,360. Applied for FWA funds. L. Weeks, city engr.

N. Y., Newton—President Queens Boro, 120-55 Queens Blvd., Kew Gardens, sewer, appurtenances in Juniper Blvd., south from 74 to 77 Sts., 77 St. from Juniper Blvd., south to Penelope Ave. $35,700.

†Okla., Norman—Federal Works Agency, 18 and F Sts. N. W., Wash., D. C., sewage disposal plant. $260,000. V. V. Long & Co., Colcord Bldg., Oklahoma City, engrs. **(Correction**—engineers:. CD 2/18—ENR 2/25.

Okla., Okmulgee—Sewer line exten. $35,000 bonds voted.

†Tex., Paris—J. W. Barnes, mayor, sewers, Tex. 41-506, $52,820. **FWA.** Rollins & Forrest, Praetorian Bldg., Dallas, engrs.

Wis., Brookfield—Town, W. C. Barrington, chn. Bd. Comrs., R. D. 5, Waukesha, making plans sewerage and sewage disposal sys., for Greenfield Heights Sanitary Dist. Under $35,000. H. Moore, 904 S. Layton Blvd., Milwaukee, engr.

Ont., Galt—C. T. Chesney, clk., municipality, incinerator, $30,000.

Ont., Windsor — Municipality, c/o C. V. Waters, clk., committee study being made sewage disposal plant. CD 12/4—ENR 12/11.

LOW BIDDERS

†N. C., Goldsboro—Federal Works Agency, 601 State Planters Bank Bldg., Richmond, Va., Mar. 12, sewer main, N. C. 31-240, from Continental Contg. Co., Fort Dodge, Ia., **$65,683. FWA.** CD 2/25—ENR 3/4.

†Texas—U. S. Eng., 25 St. and Avenue F, Galveston, Mar. 10, sewage treatment plant addns. Sol. 359-43-C53, Harris Co., from G. Mora, 312 Sabine St., Houston. CD 3/5.

†Va., Norfolk—Dir. P. Wks., City Hall, Mar. 8, sewage pump. sta., 5,200 ft. 10 to 16-in. c.i. suction line, from Hoffheimer Constr. Co., 420 Boush St., **$60,120;** furnishing, installing 14,000 ft. 20 in. pre-stressed concrete sewer force main, from Lock Joint Pipe Co., Ampere, N. J., **$149,000. FWA.** CD 3/3—ENR 3/11.

CONTRACTS AWARDED

†Arkansas—U. S. Eng., 300 Broadway, Little Rock, sewerage sys., Pulaski Co., to Mid-West Const. Co., Sioux City, Ia., under **$100,000.**

†Calif., Lamont—U. S. Dpt. Agriculture, Emergency Rubber Project, 315 W. 9 St., Los Angeles, sewage disposal sys. for labor camp, to Midstate Const. Co., 251 Kearny St., San Francisco, **$37,719.** Awarded 3/16.

†Florida—U. S. Eng., U. S. Courthouse & Post Office, Jacksonville, sewage disposal sys., Neg.-Jax-43-609, Duval Co., to O. P. Woodcock, Duval Bldg., Jacksonville, under **$50,000.** Awarded 2/26.

†Georgia—U. S. Eng., U. S. Courthouse & Customhouse, Mobile, Ala., drainage sys., Decatur Co., to A. L. Crow Constr. Co., 111 S. 41 St., Birmingham, Ala., under **$50,000.**

†Mississippi—U. S. Eng., Courthouse & Customhouse, Mobile, Ala., sewage treatment plant, Inv. 569-43-555, Hinds Co., to C. G. Kershaw Constr. Co., Martin Bldg., Birmingham, Ala., under **$50,000.** Bids 3/11, awarded 3/15.

†Texas—U. S. Eng., Fort Sam Houston, construction and facilities in sanitary area, Bexar Co., to Colglazier & Hoff, 326 Seguin Rd., San Antonio, under **$50,000.**

†Washington—U. S. Eng., 800 3 Ave., Seattle, sewage chlorinator and outfall sewerage sys., Whatcom Co., to C. V. Wilder, 2006 State St., Bellingham, under **$50,000.**

Ont., Camp Borden—Dpt. Natl. Defense, Ottawa, sewers, watermains, to Swansea Constr. Co. Ltd., 1442 Bathurst St., Toronto, **$60,000.**

BRIDGES, GRADE CROSSINGS

PROPOSED WORK

★**Minnesota**—State Hy. Dpt., St. Paul, bridge over Mississippi River near 56 Ave. N., Minneapolis, and 2 railway underpasses, constructing access roads between Robbinsdale, Hennepin Co., and New Brighton, Ramsey Co. $1,100,000.

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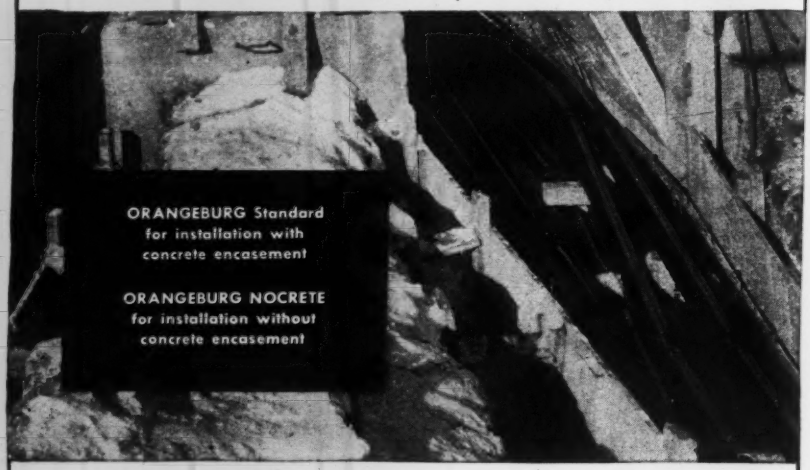

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BRIDGES (Proposed Work Contd.)

Pa., Pittsburgh—Pennsylvania RR Co., D. Wiggins, ch. engr., Union Station, Pittsburgh, railroad viaduct alterations to bed to allow 3 ft. addnl. clearance at Duquesne Way and Stanwix St. $25,000.

BIDS ASKED

Bids Asked March 31

Michigan—State Hy. Dpt., Lansing, 2 grade separations on Detroit Industrial Expressway at Southfield Rd., SN-Y-F[illegible] and B, C-1, also 2 rein.-con. bridges over Rouge River, on SN-U-FB1 [illegible] B C-1 on Industrial Expressway, both Wayne Co. Plans deposit $3 each project.

LOW BIDDERS

Michigan—State Hy. Dpt., Lansing, March 17, 2 rein.-con. grade separations and 1 bridge plant, on Detroit Industrial Expressway Outer Dr., from W. J. Storen [illegible] Detroit, **$251,209** • • • railroad underpass Chase Rd. and Wabash R. R. from L. Lamb, 1833 Park Rd., Holland, **$110,214** • • concrete bridge railings on [illegible] separations and 1 bridge from Walter [illegible] 624 Kipling St., Lansing, **$34,321** • • • box rein.-con. culvert Ecorse Creek, Carl Goodwin & Sons, 512 Ely St., Alleg. **$49,110,** all Wayne Co. CD 3/12.

STREETS AND ROADS

BIDS ASKED

Bids Asked March 31

La., Baton Rouge — City Comm. Conn. approx. 1,400 tons hot plant mixed asphaltic concrete on Florida St. from N. 11 to N. 17 Sts. E. G. Blakewood, Jr., Baton Rouge, engr.

Michigan — State Hy. Dpt., Lansing, concrete paving, curbing, guttering, etc., 1.[illegible] mi. Detroit Industrial Expressway west from Oakman Blvd. to Rouge River and approaches on Oakwood Blvd., SN-F 82-73C-3, SN-F 82-111C-1; 1.278 mi. Detroit Industrial Expressway from Ecorse Creek to west of Oakwood Blvd., south outer drive approaches to expressway, SN-UF 82-73C-2, SN-UF [illegible] 11 2C-1; 1.568 mi. approaches to Detroit Industrial Expressway on Southfield Rd., SN-F 82-73C-1, SN-F 82-109-C1, all foregoing Wayne Co.; bituminous concrete resurfacing, grading 7.964 mi. U.S. 16 Coopersville east to Marne and on U.S. 16, Marne east, SN-F 70-12C-3, SN-F 70-21C-3, Ottawa Co.; 8.[illegible] mi. U.S. 24 from M-151 northeast to Otter Creek on U.S. 24 from Otter Creek northeast to M-50, also from M-50 to M-136, SN-F 58-2-17, SN-F 58-2C-18, Monroe Co.; 5.[illegible] mi. U.S. 16 through Brighton on U.S. 16 east of Brighton, SN-F 47-1C-10, SN-F 47-15C-[illegible] Livingston Co.; 13.368 mi. U.S. 27 southwest of Lansing, Millet southwest, from west of Millett to southwest of Potterville, SN-F 23-17C-6, SN-F 23-17C-7, SN-F 23-17C-8, SN-F 33-26C-4, SN-F 33-26C-5, Eaton and Ingham Counties. Plans deposit $3 each project.

Bids Asked April 7

California — State Div. Hys., Sacramento, grading, plant mix surfacing 10.8 mi. between Lemoore Flying School and the junction with Houston Ave., 1.5 mi. west of Lemoore, Kings Co. G. T. McCoy, state hy. engr.

Bids Asked April 9

Kentucky—Dpt. Hys., Frankfort, grading, draining, high type surfacing 2.963 mi. Richmond-Mt. Vernon Rd., SN-A-FA 239D(1), SP 76-51, Madison Co.; rock asphalt seal construction 1.4 mi. U.S. 31 E through Scottsville, SP 2-23 and SP 2-95, Allen Co.; 11.649 mi. Danville-Liberty Rd., SP 11-140, SP 43-170, Boyle and Lincoln Counties; grading, draining, low type surfacing 3.089 mi. SP 8-270, SP 59-215, Boone and Kenton Counties; bituminous surfacing 10.511 mi. Princess-Bellefonte Rd., SP 10-185, Boyd Co.; 3.467 mi. Covington-Lexington Rd., SNSP 59-115 and SNSP 41-14, Grant and Kent Counties; 11.503 mi. Smithland-Eddyville Rd., SP [illegible] 110, Livingston Co.; bituminous resurfacing 3.195 mi. Providence-Clay Rd., SP 117-310, Webster Co.; 0.514 mi. Rockcastle Creek Bridge and approaches, Louisa-Inez Rd., SP 64-33, Lawrence Co.; patching concrete pavement 2 mi. Louisville-Cincinnati Rd., Trimble, Carroll, Gallatin, Boone and Kenton Counties.

Bids Asked April 16

Kentucky—Dpt. Hys., Frankfort, plant mix bituminous material on 8.045 mi. Owensboro-Fordsville, P. 30-57-B & C, 30-1057-D and 30-57-E; 0.363 mi. Owensboro-Hartford, P. 30-97-G, 0.985 mi. Ownesboro-Sorgho, P. 30-237-A, also 3.812 mi. Ownesboro-Livermore, P. 30-117-D, all foregoing Davies Co.; 5.466 mi. Earlington-Dawson Springs-Princeton, P. 54-240-B, 54-2240-C & D and 54-240-E, also 1.803 mi. Dawson Springs-Providence, both Hopkins Co.; 0.976 mi. Hartford-Owensboro, P. 92-4-D, 1.929 mi. Beaver Dam-Leitchfield, P. 92-64-C, also 5.652 mi. Ownesboro-Fordsville-Leitchfield, P. 92-1044-I and 92-44-H, all Ohio Co.; 5.359 mi. Wanamaker-Morganfield, P. 117-449-A, Webster Co., all foregoing projects in Group 1 includes 12,624 tons material; 0.337 mi. Scottsville-Franklin, P. 2-115-B, Allen Co., 10.708 mi. Morgantown-Bowling Green, P. 16-1156-B and 16-156-C & D, Butler Co.; 1.65 mi. Rockfield Rich Pond, P. 114-208-C, Warren Co., 8.6 mi. Franklin-Scottsville, P. 107-45-A, Simpson Co., foregoing in Group 2, incl. 8,445 tons material; 12.046 mi. Glasgow-Bowling Green, P. 5-4192-A, Barren Co., 1.7 mi. Bowling Green-Burton Memorial, P. 114-148-B, 2.729

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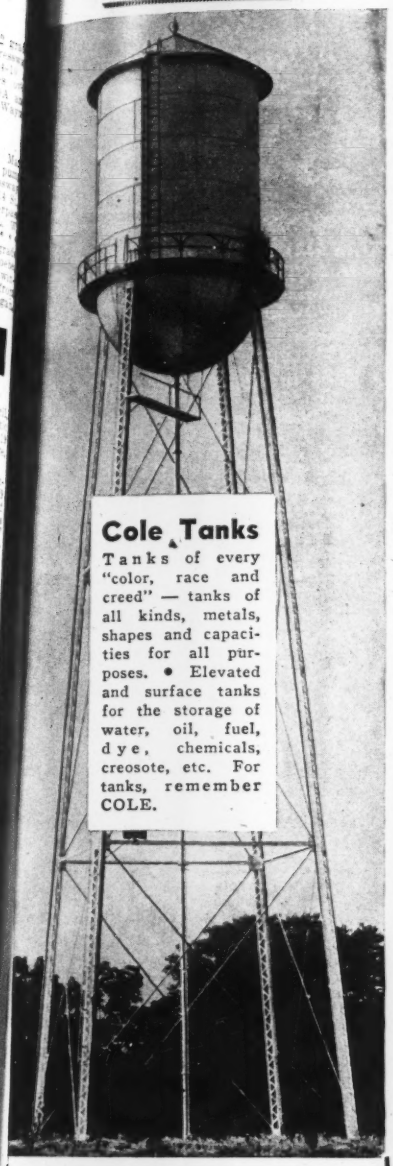

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STREETS and ROADS (Bids Asked, Cont'd.)

mi. Bowling Green-Scottsville, P. 114-168-A, also 0.737 mi. Bowling Green-Franklin, P. 114-188-C, all Warren Co., foregoing in Group 3, 6,725 tons material; 10.3 mi. Louisville-Taylorville, P. 56-98-E, Jefferson Co., 2.997 mi. Ballardsville-Eminence, P. 93-76-F, Oldham Co., both Group 4, 5,730 tons materials; 8.106 mi. Leitchfield-Elizabethtown, P. 43-55-E, Grayson Co., 7.659 mi. Elizabethtown-Leitchfield, P. 47-199-D, Hardin Co., 11.301 mi. Lebanon-New Haven, P. 78-162A, Marion Co., 8.6 mi. Bardstown-Springfield, P. 90-125-B, Nelson Co., foregoing in Group 5, 14,625 tons material; 2.858 mi. Millers Mill-Ekron, P. 82-83-A, 5.453 mi. Brandenburg-Paynesville-Concordia, P. 82-143-A, 12.197 mi. Brandenburg-Paynesville-Concordia, P. 82-143-B, 0.99 mi. St. Theresa-Mooleyville, P. 82-163-A and 2.634 mi. Paynesville-Concordia, P. 82-183-A, all Meade Co., 7.865 mi. Edmonton-Columbia, P. 85-24-D, Metcalfe Co., all foregoing in Group 6, 12,425 tons materials; 2.889 mi. Lawrenceburg-Versailles, P. 3-2071-C, 3-71-A and B, Anderson Co., 12.949 mi. Lexington-Richmond, P. 34-104-B, Fayette, 5.844 mi. Richmond-Kingston, P. 76-51-F, Madison Co., foregoing in Group 10, 10,385 tons materials; 7.5 mi. Perryville-Lebanon, P. 11-1200-A, 11-200-B, also 13.579 mi. Danville-Perryville-Springfield, P. 11-220-A, B, C, 11-1220-D and 11, 220-E, both Boyle Co., in Group 11, 9,210 tons materials.

Bids Asked

Ohio—State Hy. Dpt., Columbus, rejected bids Mar. 3, roadside imprv. 2.309 mi. Adams Co. CD 2/19—ENR 2/25.

†Texas—U. S. Eng., 416 Wright Bldg., Tulsa, Okla., addnl. driveways, Solic. 957-NEG-43-230, Gray Co. Over $25,000.

Ont., St. Catharines—Lincoln County, Court House, St. Catherine's, road materials, asphalt, crushed stone, asphalt emulsions, etc. J. E. Weir, Court House, engr.

LOW BIDDERS

California—State Div. Hys., Sacramento, Mar. 17, imprv. 0.4 mi. Marin Co., from N. M. Ball Sons, P. O. Box 430, Berkeley, **$82,913.** CD 3/5.

Louisiana—Dpt. Hys., Baton Rouge, Mar. 10, imprv. 6.957 mi., Slidell Int. Route C-1334 Hy., State Route 1076, S.P. 913-03-11, St. Tamany Parish, from Roy M. Lilly, 1255 Ingleside Dr., Baton Rouge, **$88,488.** CD 3/2—ENR 3/4.

Maryland—State Road Comn., Baltimore, Mar. 16, imprv. Lombard St. from Haven to Ponca Sts. and Ponca St. from Lombard St. to Eastern Ave., BC 177-766, from Frank Carrozza, 7 W. 25 St., Baltimore. **$130,692.** CD 3/12.

Michigan—State Hy. Dpt., Lansing, Mar. 17, imprv. 0.993 mi. Genesee Co., from Denton Constr. Co., 4-255 General Motors Bldg., Detroit, **$198,626***2.753 mi. Washtenaw Co., from Ann Arbor Constr. Co., 221 Felch St., Ann Arbor, **$52,273***0.678 mi. and 0.286 mi. Lenawee Co., from Claude M. Loomis, 415 Murray Bldg., Grand Rapids **$78,625.** CD 3/12.

Nebraska—State Dpt. Road & Irrigation, Lincoln, Mar. 18, imprv. 3 mi. DA-WI, from Abel Constr. Co., 900 N. 16 St. and Dobson & Robinson, 823 1st Natl Bank Bldg., Lincoln, **$79,682.** CD 3/9—ENR 3/11.

New York—Comr. Parks, office Dpt. Parks, Arsenal Bldg., Central Park, 5 Ave. and 64 St., New York, Mar. 15, repaving Bronx-Whitestone Parkway, Contr. Q-125-143, Whitestone, Queens Boro, from A. J. Fleming, 87-74 110 St., Richmond Hill. **$26,552.**

Oregon—State Hy. Comn., Salem, Mar. 17, traffic interchange sys. at intersection N. Denver Ave. with Union Ave., Swift Blvd., south of interstate bridge, Multnomah Co., from Henry L. Horn, Caldwell, **$318,116*** John Day Rock Production Project, Grant Co., from Chester C. Lackey, Ontario, **$45,350.** No bids received Drinkwater Pass-Juntura Rock Production, Barney and Malheur Counties, and Crescent Rock Production project on The Dalles-California Hy., Klamath Co. Will readvertise. Withdrew bids Mar. 17, West Vanport connection on Swift Secondary Hy., Multnowah Co. CD 3/15.

Virginia—Office Dpt. Hys., Richmond, Mar. 18, imprv. 2.301 mi., Norfolk Co., from C. H. Lawson, Williamsburg, and E. G. Bowles, Richmond Air Base, Richmond, **$66,696.** Est. $60,402. CD 3/15—ENR 3/18.

CONTRACTS AWARDED

Alabama—State Hy. Dpt., Montgomery, grading, paving 0.72 mi., Michigan Ave., Mobile Co., to Southeastern Const. Co., Ozark, **$205,740.** Bids 3/5. CD 3/10—ENR 3/18.

Arkansas—State Hy. Dpt., Little Rock, imprv. 21.383 mi. Desha Co., to Groves Bros., Hamburg, **$72,383.** CD 2/26.

†Florida—U. S. Eng., U. S. Courthouse & Post Office, Jacksonville, grading, paving, Neg.-P.Y.-43-1, Taylor Co., to Wainer Const. Co., Valdosta, Ga., under **$100,000.** Awarded 3/1.

†Florida—U. S. Eng., U. S. Courthouse & Post Office, Jacksonville, roads, Neg-Jax-43-588, Taylor Co., to J. B. Gibson Const. Co., Donalsonville, Ga., under **$50,000.** Awarded 3/2.

Kansas—State Hy. Dpt., Topeka, grading, concrete paving 1.53 mi. Johnson Co., DANR 2, to Cameron-Joyce & Co., Keokuk, Ia. **$75,577.** Awarded 3/13. CD 2/24.

†Louisiana—U. S. Eng., 25 St. and Avenue F, Galveston, Tex., road construction, Cal-

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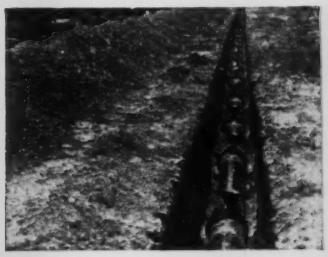

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TUNNEL LINER PLATES

STREETS and ROADS (Contracts Awarded, Cont'd.)

casieu Parish, to T. W. Kleinpeter, 4047 Hatcher Ave., Baton Rouge, under **$50,000.**

†New Mexico—U. S. Eng., Albuquerque, dust palliative treatment, surface preparation and application bituminous material, Luna Co., to A. O. Peabody, Santa Fe, under **$50,000.**

†New Mexico—U. S. Eng., Albuquerque, dust palliative treating, Otero Co., to Skousen Bros., Albuquerque. **$100,000-$500,000.**

†New Mexico — U. S. Eng., Albuquerque, addnl. roads and sewage disposal plant addn., San Miguel Co., to A. O. Peabody, Santa Fe., under **$50,000.**

†North Carolina—U. S. Eng., 308 Customhouse, Wilmington, stabilized surface course for portions motor parking areas, Durham Co., to J. M. Thompson & Co., Lawyers Bldg., Raleigh, under **$50,000.** Bids 3/11.

★**Ohio**—State Hy. Dpt., Columbus, grading, concrete paving, 2 concrete rigid bridges, 72 and 76 ft. spans, roadside imprv. Sect. Brookpark, Berea and Cleveland of SH 713, and sections Brookpark and Cleveland of SH 460, Cuyahoga Co., to The Horvitz Co., 913 Midland Bldg., Cleveland, **$1,299,183.** Est. $1,644,000. Bids 3/5. CD 2/19—ENR 2/25.

†Ohio—U. S. Eng., U. S. Post Office & Courthouse, Cincinnati, roads, parking areas, railroad extens., Marion Co., to Jones Contg. Co., 808 Murphy Bldg., Highland Park, Mich. under **$50,000.**

Oklahoma—U. S. Eng., 416 Wright Bldg., Tulsa, construction and completion roads and grading, Okmulgee Co., to Frank H. Freeto t/a Freeto Constr. Co., Pittsburg, Kan., **$100,000-$500,000.** BA 3/8.

†Pennsylvania—U. S. Eng., 6 and Walnut Sts., Phila., roadways and walkways addns., Philadelphia Co., to Turner Constr. Co., Architects Bldg., Phila., under **$50,000.**

★**Tennessee**—State Hy. Dpt., Nashville, imprv. 2.044 mi. Sullivan Co., to A. B. Long, Harriman, **$618,164.** Bids 3/5, awarded 3/18. CD 3/9—ENR 3/11 under LB.

†Virginia—U. S. Eng., 415 P. O. & Court House Bldg., Norfolk, roads and parking area, Norfolk Co., to Y. L. Brown, West Point, under **$50,000.**

†Washington—U. S. Eng., 800 3 Ave., Seattle, grading, paving, Pierce Co., to J. D. Shotwell, 1624 Puget Sound Bank Bldg., Tacoma. **$100,000-$500,000.**

★**B. C., Victoria**—Province of British Columbia, road reconstruction for year 1943-44, day labor. **$2,144,570** voted. Dpt. Hys., Victoria, engrs.

★**Sask., Regina**—Province of Saskatchewan, road reconstruction program, 1943-44, day labor. **$2,000,000** voted. Dpt. Hys. & Transportation, Legislative Bldg., engrs.

EARTHWORK, WATERWAYS

PROPOSED WORK

La., Montegut—The Texas Co., 919 St. Charles St., New Orleans, 250 ft. timber pile, sheet pile bulkhead near here, Terrebonne Parish.

BIDS ASKED

Bids Asked March 30

†Arkansas—U. S. Eng., U. S. Post Office & Courthouse, Vicksburg, Miss., 400,600 cu. yd. earth work on west (right) bank Red River, Miller Co.

Bids Asked April 3

Illinois — Comrs. Mineral Marsh Special Drainage Dist. Bureau and Henry Counties, c/o Jacob A. Harman, Inc., engrs., 144 Fredonia Ave., Peoria, cleaning out and repairing ditches and levees with about 1,100,000 cu. yd. excav.

Bids Asked April 4

†Mississippi—U. S. Eng., U. S. Post Office & Courthouse, Vicksburg, channel clearing and snagging 37.5 mi. Cassidy Bayou, Tallahatchie Co. Item CA-19. $60,000.

†Texas—U. S. Eng., 25 St. and Avenue F, Galveston, overhead irrigation sys., incl. 15,000 ft. 6 and 8 in. buried watermains, 3,000 ft. surface lines, connections, etc., Maverick Co. Over $15,000. Plans deposit $25.

Bids Asked April 6

†Mississippi and **Arkansas**—U. S. Eng., U. S. Post Office & Courthouse, Vicksburg, Miss.,

Hayward Buckets

Use this Class "E" Clam Shell Bucket for handling crushed stone, gravel, sand and other bulk materials.

THE HAYWARD CO., 48-50 Church St., N. Y.

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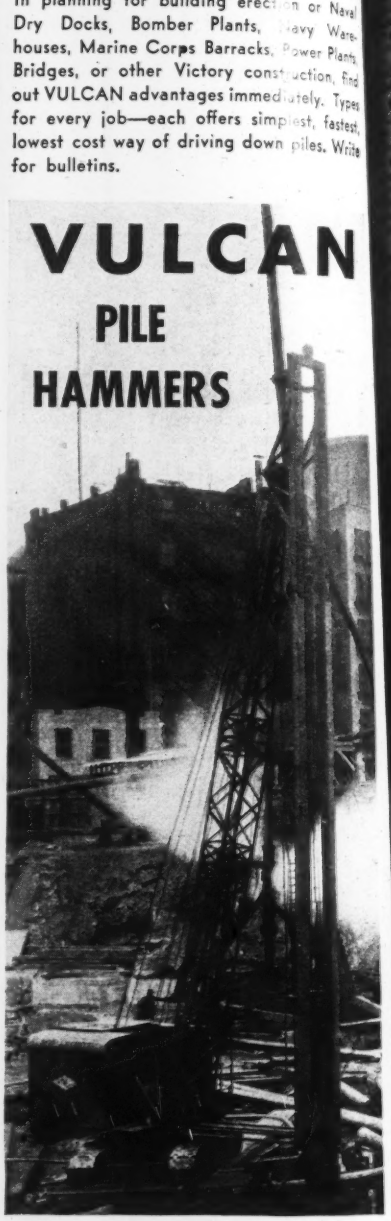

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HWORKS, etc. (Bids Asked, Cont'd.)
880,000 cu. yd. earthwork on east and anks of Mississippi River, in above states.

BIDDERS

Wash., Tacoma—Bd. Contr. & Awards, City Mar. 17, steel penstock manifold com- with elbows, etc. for second Nisqually development, from Western Pipe & Co., 200 Bush St., San Francisco, Calif., CD 3/10.

TRACTS AWARDED

Arkansas—U. S. Eng., P. O. Box 97, Memphis, Tenn., 620,000 cu. yd. uncom- earthwork in Lower St. Francis Levee No. 1092-43-161, to C. J. List Solic. Co., Railway Exchange Bldg., Kansas Mo., less than **$500,000;** 695,000 cu. yd., No. 1096-43-161-R 164, to Atlas Const. Waxahachie, Tex., less than **$500,000,** Mississippi Co. CD 3/18—ENR 3/25, LB.

California—U. S. Eng., 74 New Montgomery San Francisco, earthwork, Monterey Co., Sierra Trucking Co., Inc., 1420 S. Virginia Reno, Nev. Awarded 3/17.

Mass., South Boston (sta. Boston)—Yards & Navy Dpt., 18 St. and Constitution N.W., Wash., D. C., addnl. earth fill at channel base, NOY 6014, to Marinucci 51 Ceylon St., Dorchester, **$276,000.** 3/2.

Nebraska—U. S. Eng., 1709 Jackson St., excavation of channel, installing line, manholes, etc., Box Butte Co., to Mann, Rapid City, S. D., under **$50,000.**

Tennessee—Tennessee Valley Auth., Knox- C. H. Garity, dir. Purchases, dredging Tennessee River, below Watts Bar Dam, 456403, own forces. Bids 2/4 rejected. 1/19—ENR 1/21.

Texas—U. S. Eng., 231 W. Main St., Deni- grading, ground preparation, levelling, ding, etc., Hunt Co., to McGinnis & Grafe, Austin Ave., Austin, under **$50,000.** Bids CD 2/12.

UNCLASSIFIED

PROPOSED WORK

Ark., Eldorado — IMPROVEMENTS — Civil Aeronautics Admin., Box 1689, Ft. Worth, Tex., imprvs.

Calif., Fresno—REMOVING STREET CAR RAILS, etc.—War Materials, Inc., Palace Hotel, San Francisco, cancelled contract re- moving approx. 1 mi. street car rails Wishon Ave. and N. Fresno Sts. and repaving slots from certain streets in Fresno. CD 2/9—ENR 2/11, under CA.

Connecticut — DOCK — U. S. Coast Guard Acad., Maritime Officers' Training School, Fort Trumbull, concrete timber dock.

Illinois—New York—PUMPING STATIONS—War Emergency Pipelines, Inc., 1429 Enquirer Bldg., Cincinnati, O., bids soon, 18 pump. stations.

Ill., Decatur — IMPROVEMENTS — City, imprvs. Over $25,000.

Ind., Ft. Wayne—TRACK ELEVATION—City and New York, Chicago & St. Louis R.R., J. C. Wallace, ch. engr., Terminal Tower, Cleveland, O., track elevation partly with a part wooden structure and changes in track alignment. $384,736.

Ia., Clarion—IMPROVEMENTS—H. G. Bowman, mayor, approved $14,000 bond issue, imprvs. $25,000. Plan CAA participation.

Ia., Webster City—IMPROVEMENTS—City, $35,000 bond election Mar. 29, imprvs.

Kan., Pittsburg—IMPROVEMENTS — $150,000 bond election April 6, imprvs.

Kan., Wichita — IMPROVEMENTS — City, fire protection facilities for imprvs., incl. 500,000 gal. underground concrete water reservoir, fire equipment and fire station bldg., etc., $45,000. Applied to FWA.

Louisiana—OIL WELL—Fohs Oil Co., Pilgrim Exploration Co. and Shell Oil Co., Shell Bldg., Houston, drilling, casing, developing 11,600 ft. oil well, La Fourche Parish.

Mass., Medford-Somerville (br. Boston)—TROLLEY RAIL REMOVAL—War Materials, Inc., 128 Washington St., Boston, rejected bids Jan. 28, removing steel trolley rails from various streets.

Mass., Southbridge—TROLLEY RAIL REMOVAL—War Materials, Inc., 120 Washington St., Boston, rejected bids Feb. 3, removing steel rails from various streets. CD 2/1.

Mass., Swampscott—TROLLEY RAIL REMOVAL—War Materials, Inc., 128 Washington St., Boston, rejected bids Jan. 25, removing steel trolley rails from various streets. CD 1/18—ENR 1/21.

Minn., Duluth — IMPROVEMENTS — City, imprvs., incl. facilities for water supply, lighting equip, etc. $350,000. I. W. Ward, city engr.

★ **Nebraska**—IMPROVEMENTS—U. S. Eng., 1709 Jackson St., Omaha, imprvs., bldg., Adams Co. $1,000,000. Davis & Wilson, 525 S. 13 St., Lincoln, archts.

THE large volume of concrete involved in this massive structure made imperative the use of an expansion joint of time-proved DEPENDABILITY. The selection of CAREY Elastite Asphalt Joint for this important job is, therefore, a tribute to the outstanding qualities of this widely favored product.

Carey Elastite Asphalt Joint consists of two layers of asphalt-saturated felt, between which is interposed a layer of heavy plastic asphalt compound, the whole being inseparably bonded together under heat and pressure. Used according to recommended specifications, this material will absorb the forces of expansion and contraction—prevent damage—add to permanence —lower maintenance.

Available in a variety of thicknesses, widths and lengths. It may be cut to any shape or dimension and can be furnished ready to set in place in the work. Write for specifications and samples to Dept. 30.

Handy pocket rule mailed upon request.

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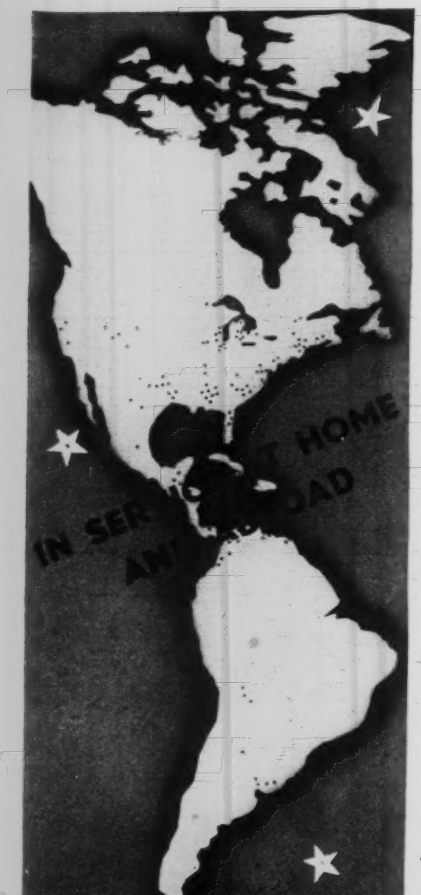
★ MASSIVE OHIO HIGHWAY VIADUCT PROTECTED AGAINST EXPANSION DAMAGE BY Carey Elastite ASPHALT EXPANSION JOINT



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McCRACKEN Machines Make: Soil Pipe—Drain Tile—Culvert Pipe—Conduit. Either plain or reinforced. 4" thru to 36".

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2. Of the Highest Quality
3. At the Lowest Cost
4. In Any Location

McCRACKEN PIPE

CONCRETE PIPE MACHINERY CO.
• Sioux City, Iowa, U.S.A.

UNCLASSIFIED (Proposed Work, Cont'd.)

†**Nebraska**—IMPROVEMENTS—U. S. Eng., 1709 Jackson St., Omaha, imprvs., removing bldgs., etc., Sarpy Co., under $100,000.

N. D., Milnor—RURAL ELECTRIC TRANSMISSION LINES—R.S.R. Electric Co-operative, Inc., 240 mi. rural electric transmission lines, Ransom, Sargent and Richland Counties. $200,000. Banister Eng. Co., 1586 University Ave., St. Paul, Minn., engr.

★**Ohio**—NATURAL GAS PIPELINE—East Ohio Gas Co., N. F. Robinson, pres., E. 6 St. and Rockwell Ave., Cleveland, 22,500 tons of 22 in. pipeline. $3,200,000.

S. D., Belle Fourche—IMPROVEMENTS—City, imprvs. $30,000.

Tex., Harrold—OIL WELL—British-American Oil Co., Wichita Falls, drilling, developing 6,000 ft. oil well.

†**Va., Virginia Beach**—BATHHOUSE FACILITIES—Federal Works Agency 601 State Planters Bank Bldg., Richmond, USO club bldg. addn. Project Va. 44-249, to provide bathhouse facilities, Carneal, Johnston & Wright, Richmond, archts. $5,600.

★**Ontario**—BLOCK SIGNAL SYSTEM—Canadian Pacific R.R., T. B. Ballantyne, dist. engr. (Ontario Dist.) Union Station, Toronto, installing block signal sys. between Chapleau and Schreiber, $1,000,000.

Ont., Galt—SWIMMING POOL—C. T. Chesney, clk., municipal, swimming pool. $25,000.

Que., Grand Mere—ARENA—Municipality, c/o M. Crete, clk., rebuilding arena. $25,000, P. L. Pratley, 1117 Ste. Catherine W. Montreal Ave., engr.

Que., Montreal—IMPROVEMENTS—Acting Dpt. Secy. Transport, Ottawa, bids soon, imprvs., near here. $200,000.

BIDS ASKED

Bids Asked March 30

Ind., West Lafayette—IMPROVEMENTS—Purdue University, Bd. Trustees, R. B. Stewart, controller, Executive Bldg., imprvs., boiler and fuel room, offices, students' room, instructors' rooms, locker rooms, cafeteria, kitchen, etc. Walter Scholer, 1114 State St., Lafayette, archt.

†**S. C., Chester**—IMPROVEMENTS—Civil Aeronautics Admin., Hapeville, Ga., imprvs. Tentative date.

Bids Asked March 31

Manitoba—IMPROVEMENTS—Acting Secretary Dpt. Transport, Ottawa, Ont., imprvs., clearing, grubbing, smoothing, grading, draining, at Chater, Hartney, Oberon, Petrel. About $350,000. Plans deposit $10 each job.

Bids Asked April 1

Wash., Seattle—STREET CAR TRACK REMOVAL, etc.—Bd. P. Wks., removing street car tracks, concrete resurfacing Yesler Way, 2 Ave. S. 3, Occidental Western and 4 Aves., Main, Jackson, Pike, Union, Madison and James Sts. $113,199. C. L. Wartelle, County-City Building., engr.

Bids Asked

†**Massachusetts**—TOWERS—U. S. Eng., Park Square Bldg., Boston (selected list bidders), towers, No. 175-43-NEG 255, Essex Co.

†**Texas**—COMPASS SWINGING BASE—U. S. Eng., 25 St. and Avenue F, Galveston, compass swinging base, Solic. 359-43-C62, McLennan Co. Over $25,000. Plans deposit $25.

†**Tex., Houston**—RELOCATING FARMSTEADS, etc.—Federal Works Agency, 704 City Hall Bldg., dismantling, moving, relocating existing farmstead bldgs. and imprvs., RR-Tex.-19. Over $25,000.

LOW BIDDERS

★†**Minn. Alexandria**—IMPROVEMENTS—Civil Aeronautics Admin., 608 S. Dearborn St., Chicago, Ill., Mar. 5, imprvs., Schedules 1 and 2, Alternate B, from Megarry Bros., St. Cloud, **$528,570**; Schedules 1 and 2, Alternate A, from Hallett Constr. Co., Crosby, **$751,708**. CD 2/25—ENR 2/4.

New York—PLANTING, etc.—Comr. Parks at Office Dpt. Parks, Arsenal Bldg., Central Park, 64 St. and 5 Ave., New York, Mar. 18, landscaping junctions Brooklyn Connecting Hy. with Grand Central Parkway Exten., North Beach, Queens Boro from Meadow Brook Nurseries, Inc., 28 Engle St., Englewood, N. J., **$114,285**. CD 3/9—ENR 3/11.

New York—PLANTING—Comr. Dpt. Parks, at office Dpt. Parks, Arsenal Bldg., Central Park, 5 Ave. and 64 St., New York, Mar. 19, planting Francis Lewis Blvd. from Hillside Av., to Horace Harding Blvd. No. Q6-135-141, Queens Boro, from Lincolndale Nurseries, Lincolndale **$110,269**. CD 3/15.

Wash., Seattle—STREET CAR TRACK REMOVAL, etc.—City, County-City Bldg., Mar. 18, removing car tracks, concrete resurfacing E. 55 St., from T. Romano, 1833 Dearborn St., **$70,668**. Est. $78,357. CD 3/10.

CONTRACTS AWARDED

†**Alabama**—IMPROVEMENTS—U. S. Eng., U. S. Courthouse & Customhouse, Mobile, imprvs., paving and drainage, Inv. 569-43-566, Jefferson Co., to Sullivan, Long & Haggerty Co., Bessemer. Bids 3/11.

†**Alabama**—RAILWAY SPUR TRACK, etc.—U. S. Eng., U. S. Courthouse & Customhouse, Mobile, railway spur track, excavating, grading, drainage, No. 569-43-557, Mobile Co., to A. L. Crowe Const. Co., 111-41 St. S., Birmingham. Bids 3/9.

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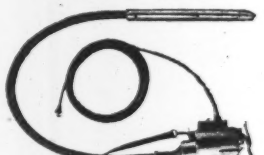

Model V2-AS Vibrator

Electric Vibrator—for concrete vibrating.

Portable Electric Surfacer—for surfacing concrete.

Portable Electric Water Feed Surfacer—for wet grinding.

Gasoline Driven Surfacer—for surfacing bridges, culverts, etc.

Hi-Way Surfacer—gasoline—for removing irregularities on highways.

Attachments—for Wire Brushing, Sanding and Polishing.

THE CONCRETE SURFACING MACHINERY CO.
4667 Spring Grove Ave.
Cincinnati, Ohio

ASSIFIED (Contracts Awarded, Cont'd.)

rizona—IMPROVEMENTS—U. S. Eng., S. Figueroa St., Los Angeles, Calif., No. 1158, Pima Co., to PDOC Co., Bldg., Phoenix, over **$500,000.** Awarded 2. CD 3/10—ENR 3/18 under LB.

lifornia—DUST CONTROL—U. S. Eng., St., Sacramento, dust control, Spec. g Spec. 448, Fresno Co., to Louis Vis- Live Oak. Est. under **$50,000** each Awarded 3/13. CD 3/12—ENR 3/18 LB latter project.

lifornia—DUST CONTROL—U. S. Eng., St., Sacramento, dust control, Spec. Kern Co., to Capital Nursery, Freeport Sacramento. Est. under **$50,000.** ded 3/13. CD 3/12—ENR 3/18, under CA.

lifornia — LIGHTING — U. S. Eng., 74 Montgomery St., San Francisco, lighting al bunkering sys., Alameda Co., to El no Electric Co., 2411 El Camino Real, Alto. Awarded 3/16.

lifornia—WHARFS—U. S. Eng., 74 New tgomery St., San Francisco, imprv. fs, Alameda Co., to Ben C. Gerwick, 112 Market St., San Francisco. Awarded

alifornia—IMPROVEMENTS—U. S. Eng., S. Figueroa St., Los Angeles, Calif., rvs., Los Angeles Co., to P. A. Weeger, Santa Monica Bldg., Los Angeles, under 000.

Connecticut—REMOVING HIGH TENSION ERS—U. S. Eng., 819 Industrial Trust Bldg., idence, R. I., removal high tension wires, 699-43-177, Hartford Co., to Springfield tric Co., Inc., 51½ Taylor St., Springfield, Est. under **$50,000.**

Delaware—IMPROVEMENTS—U. S. Eng., nd Walnut Sts., Phila., Pa., imprvs., nage, New Castle Co., to Eastern Sea- d Engineers, Inc., Collingswood, N. J., er **$50,000.**

Florida—AUTOMATIC SPRINKLER SYS- —U. S. Eng., U. S. Courthouse & Post e, Jacksonville, automatic sprinkler sys., llas Co., to Automatic Sprinkler Corp. America, 161 Spring St. N.W., Atlanta, **$50,000-$100,000.**

Florida — IMPROVEMENTS — U. S. Eng., S. Courthouse & Post Office, Jacksonville, rvs., Dade Co., to Lester F. Perry Corp., 0 Alton Rd., Miami Beach, under **$50,000.**

Florida — CONSTRUCTION — U. S. Eng., S. Courthouse & Post Office, Jacksonville, ellaneous construction, Duval Co., to In- rial Heating & Plumbing Co., Yukon, 0,000-**$500,000.**

Florida—BLACKOUT FACILITIES—U. S g. U. S. Courthouse & Post Office, Jack- ville, blackout facilities, Neg-Jax-43-590, m Beach Co., to Sistrunk, Inc., 535 N.W. St., Miami, under **$50,000.** Awarded 2/26.

Florida — ELECTRIC DISTRIBUTION — S Eng., U. S. Courthouse & Post Office, cksonville, electric distr addns., Neg-Jax- 573, Highlands Co., to Lipscomb Electric Lakeland, under **$50,000.** Awarded 2/16.

Florida—GASOLINE STORAGE and DIS- ENSING SYSTEM—U. S. Eng., U. S. Court- use & Post Office, Jacksonville, gasoline rage and dispensing sys., Neg.-Jax-43-619, e Co., to Cleary Bros. Const. Co., Georgia re., West Palm Beach, Fla. Est. under 0,000. Awarded 2/25.

Florida — IMPROVEMENTS — U. S. Eng., S. Courthouse & Post Office, Jacksonville, mprvs., Highlands Co., to John H. Mann, Avon Park, under **$50,000.**

Florida — RAILROAD TRACKS — U. S. g., U. S. Courthouse & Post Office, Jack- nville, railroad tracks, Neg-Jax-43-631, Dade Co., to W. T. Price Dredging Corp., 200 S.W. 27 St., Miami, under **$500,000.** Awarded 2/28.

Florida — STEAM BOILER SETTINGS — U. S. Eng., U. S. Courthouse & Post Office, acksonville, steam boiler settings, Neg-O.R.- 2-58, Orange Co., to Henry G. Dupree, 1931 Hendricks Ave., Jacksonville, under **$50,000.** Awarded 2/23.

Georgia — FACILITIES — U. S. Eng., Post Office Bldg., Savannah, addnl. facilities, Thomas Co., to Christian & Bell Co., 101 Marietta St. N.W., Atlanta, under **$50,000.**

Georgia—SPRIGGING, etc.—U. S. Eng., S. Courthouse & Post Office, Jacksonville, la., sprigging, seeding, Neg.-Jax-43-615, Lowndes Co., to Island Landscape Co., Inc., 09 S. Country Rd., Palm Beach, Fla., under 50,000. Awarded 3/1.

Illinois — IMPROVEMENTS — U. S. Eng., 20 Merchandise Mart, Chicago, imprvs., ldgs., Lawrence Co., to Welso Constr. Co., 233 W. Grand Ave., Chicago.

★**Ill., Glenview** — FACILITIES — Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., addnl. facilities, NOY 5648, Supplementary Agreement 1, to Standard Paving Co. & White Consolidated, Inc. & Midwest Constr. and Asphalt Co., 30 N. La Salle St., Chicago, **$1,534,300.** Awarded 3/9. Additional to CD 2/23—ENR 2/25 under CA.

Indiana — IMPROVEMENTS — U. S. Eng., Federal Bldg., Louisville, Ky., addnl. imprvs., Bartholomew Co., to Benjamin Chemers Co., 111 W. Washington St., Chicago, Ill. **$100,000-$500,000.**

PREVENT SHUTDOWNS . . .
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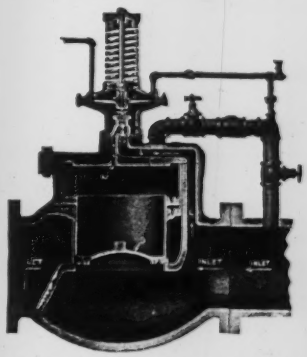
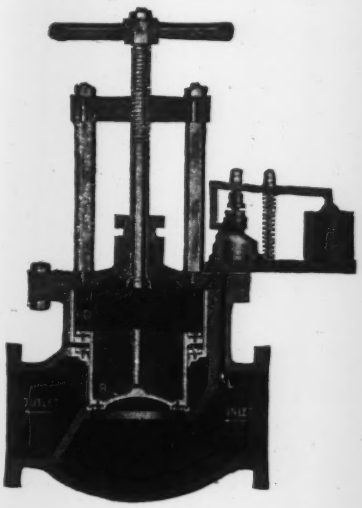
MAINTENANCE FREE VALVES

Present-day abnormal requirements are throwing heavy over-loads on water supply systems—causing demands for continuous service with few, if any, shutdowns. Guard against serious delays and expensive replacements . . . use GOLDEN-ANDERSON Valves. There is a G-A Specialty Valve for every service. The exceptionally wide range includes Water Pressure Reducing Valves, Water Control Valves, Single and Double Acting Altitude Valves, Electric and Manual Water Service Valves. Write today for information and catalogs . . . tell us your particular problem. We have a G-A Specialty Valve to fit *your* particular requirements.



Altitude Control Valve — Maintains constant water levels within 3 to 12 in. variations. Differential control permits delayed valve opening for any depth tank. Available in electric control or remote operation types—single or double acting. 2" to 36" sizes.



Electric and Manual Water Service Valves—Arranged to open or close automatically whenever solenoid is energized or de-energized. Also available for direct manual operation. Solenoid furnished for any voltage—A.C. or D.C. Sizes—3" to 36".

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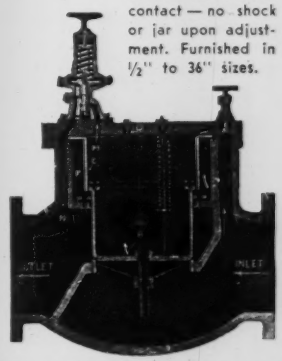
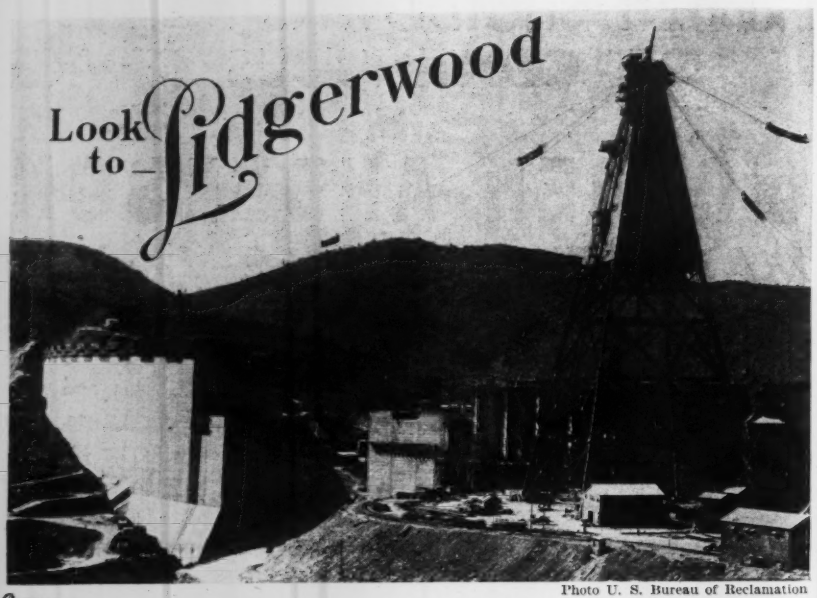


GOLDEN-ANDERSON
VALVE SPECIALTY COMPANY
1300 FULTON BLDG. **PITTSBURGH, PENNA.**



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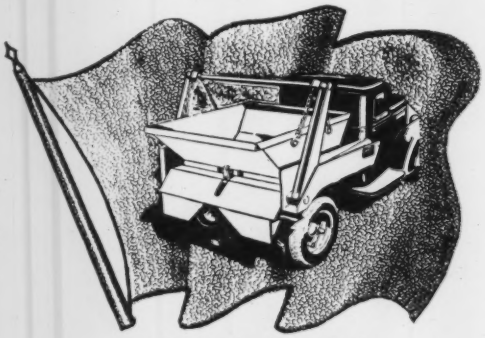
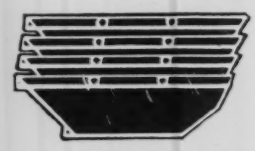


BROOKS LOAD LUGGER



Buckets can be nested for easy carrying when empty. One-piece all-welded construction. Capacities: 1 to 4½ cubic yards, wet or dry.

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UNCLASSIFIED (Contracts

†**Kansas** — IMPROVEMEN — U. S. 10 E. 17 St., Kansas City, Co., to Tulsa Rig & Re Bldg., Tulsa, Okla. Est. un $50,000.

†**Kansas**—NIGHT LIGHT SYSTEM— S. Eng., 10 E. 17 St., night lighting sys., Geary stant, Lawrence. Est. under 50,000.

★†**La., New Orleans**—IM OVEMEN Yards & Docks, Navy Constitution Ave. N.W., Was NOY 5952, to W. Horace Howard Ave., **$844,675.** Awa

†**Maine**—CONCRETE WOR St. James Ave., Boston, Mass No. 175-43-Neg 251, to T Inc., 15 State St., Bangor. Es under $50,

†**Maryland**—IMPROVEMEN — U. S. Standard Oil Bldg., Baltimore more Co., to Consolidated E E. Franklin St., Baltimore, un $50,000.

†**Massachusetts** — LOADING FACILITIE U. S. Eng., Park Square Bldg., facilities, platforms, etc., No. 175-43-NEG Suffolk Co., to Joseph E. Bo Newbury St., Boston. Est. un $50,000.

†**Massachusetts**—CONCRETE WORK—U. Eng., 31 St. James Ave., Bo work, No. 175-43-Neg. 252, to hue, 138 Liberty St., Lynn. Est. under $50,000.

★†**Minnesota** — MINING PIT DEVELO MENT—Lake Mining Co., Northern Iron Ore Properties, Natl. Bank Bldg., St. Paul, burden for developing mining on Sabin and Wine Lakes, to Winston Bros. Co., 1470 Bank Bldg., Minneapolis; diver barrass River, to J. A. Terteling 1406, Boise, Idaho. RFC. Est. $4,000,000.

†**Mississippi** — ELECTRICAL DISTRI TION SYSTEM—U. S. Eng., house & Customhouse, Mobile, Ala., head electrical distr. sys., Hinds Co., to Irby, 815 S. State St., Jackson. Est. under **$1,000,000.**

★†**Nebraska**—IMPROVEMENTS—U. S. Eng. 1709 Jackson St., Omaha, imprvs. Co., to Peter Kiewit Sons Co., Omaha Bank Bldg., Omaha, and Big Horn Constr. Sheridan, Wyo. Est. over **$500,000.**

†**Nebraska**—ELECTRICAL DISTRIBUTI etc.—U. S. Eng., 1709 Jackson St., Oma imprvs., outside electrical distr. and wiring, Fillmore Co., to Evans Elec Constr. Co., 1626 Walnut St., Kansas City, CD 3/5—ENR 3/11 under CA.

†**Nebraska**—IMPROVEMENTS—U. S. Eng 1709 Jackson St., Omaha, imprvs., wiring, Hall Co., to Simpson Electric Cheyenne, Wyo.; outside electrical distr. Jensen & Krage, 209 Wright Bldg., Sioux City Ia. CD 3/5—ENR 3/11 under CA.

†**New Mexico**—CONSTRUCTION—U. S. Eng Albuquerque, addnl. temporary constr De Baca Co., to Maxey & Leftwich, Lubbock Tex., **$100,000-$500,000.**

†**New Mexico** — IMPROVEMENTS — U. S. Eng., Albuquerque, imprvs., addnl. housing Chaves Co., to Parks-Marshall-Mechlin Constr. Co., 4707 Elsby St., Dallas, Tex., under **$200,000.** Awarded 3/11.

†**New Mexico** — IMPROVEMENTS — U. S. Eng., Albuquerque, imprvs., Curry Co., to Nolan Bros. Inc. and C. A. Wagner, 709 Mc Bldg., Minneapolis, Minn. **$100,000-$500,000.**

★†**New York**—FACILITIES—U. S. Eng. 120 Wall St., New York, facilities, expans housing, Orange Co., to Iglehart, Caldwell & Scott, Inc., 99 Broad St., New York. **$500,000-$1,000,000.** CD 3/5—ENR 2/25 under BA.

†**New York**—IMPROVEMENTS—U. S. Eng. 120 Wall St., New York, imprvs., concrete paving, Warren Co., to Collins Bros. Mechanicsville, under **$500,000.** Bids 3/9.

†**New York**—LIGHTING SYSTEM—U. S. Eng., 120 Wall St., New York, lighting sys. Orange Co., to Edward Zwicker Corp., 45 Lexington Ave., New York, under **$50,000.**

†**North Carolina**—FENCING—U. S. Eng. 20 Customhouse, Wilmington, fencing, Durham and Wake Counties, to W. E. Baker Constr. Co., Durham, under **$50,000.** Bid 3/12.

†**North Carolina**—IMPROVEMENTS—U. S. Eng., 308 Customhouse, Wilmington, imprvs. surfacing parking areas, Wayne Co., to F. D. Cline, Fairview Rd., Raleigh. Bids 3/11.

★†**Ohio** — IMPROVEMENTS — U. S. Eng. Chesapeake & Ohio Bldg., Huntington, W. Va., imprvs., Richland Co., to H. Kaplan Co., 751 N. Paulina St., Chicago, Ill. Total est. **$7,000,000.** Bids 2/15. CD 2/11.

†**Oklahoma**—FACILITIES—U. S. Eng., 420 Wright Bldg., Tulsa, addnl. facilities, Garfield Co., to Mefford-Davis Constr. Co., Enid, under **$50,000.**

★†**Oklahoma** — IMPROVEMENTS — U. S. Eng., 231 W. Main St., Denison, Tex., imprvs., asphalt and concrete paving, Carter Co., to Texas Bitulithic Co., 111 Commerce St., Dallas, Tex., **$1,000,000-$5,000,000.** Awarded 3/12.

†**Pennsylvania**—FIRE PROTECTION FACILITIES—U. S. Eng., 6 and Walnut Sts., Phila., addnl. fire protection facilities, Philadelphia Co., to Benjamin Lessner Co., 4023 Orchard St., Phila., under **$50,000.**

Pa., Meadville — IMPROVEMENTS, etc.—Graham Flying Schools, C. Ball, genl. mgr., Port Meadville, Meadville, imprvs., machine

IFIED (Contracts Awarded, Cont'd.)
ice plant, to E. J. Benes & Co., 15508
Cleveland, O. Est. **$40,000.**

Beaufort—IMPROVEMENTS—Civil
autics Admin., Candler Bldg., At-
imprvs., Prop. 2R-133, to Mecklen-
str. Co., Durham, N. C., **$901,621.**
CD 3/18 under LB.

Dakota — IMPROVEMENTS — U. S.
8 Jackson St., Omaha, Neb., imprvs.,
utilities for bldgs., roads, parking
ences, etc., Davison Co. to W. E.
now & Son Const. Co., Huron, under

ece—IMPROVEMENTS—U. S. Eng.,
g St. N.W., Atlanta, Ga., imprvs.,
to Weymouth Constr. Co., Dyers-
der **$50,000.**

-Oklahoma — IMPROVEMENTS —
g., 221 W. Main St., Denison, Tex.,
to Ramsey's Austin Nursery, 4525
e St., Austin, Tex., under **$50,000.**

—GASOLINE STATION—U. S. Eng.,
n Houston, addnl. gasoline and fuel-
ons, Brown Co., to C. Oehler, 5007
Galveston, under **$50,000.**

—IMPROVEMENTS—U. S. Eng., Al-
que, N. M., imprvs., bldgs., facilities,
Co., to R. E. McKee, 1918 Texas
Paso, **$100,000-$500,000.**

—IMPROVEMENTS—U. S. Eng., 416
Bldg., Tulsa, Okla., imprvs., Dallam
Uvalde Constr. Co., Santa Fe Bldg.,
$50,000-$100,000. Bids 3/4.

—IMPROVEMENTS—U. S. Eng., 25
Avenue F, Galveston, imprvs., bldg.,
Co., to Noser Constr. Co., McAllen,
$50,000.

— UTILITY YARD FACILITIES —
Eng., 221 W. Main St., Denison, Tex.,
yard facilities, Collin Co., to Reid-
Constr. Co., McKinney, under **$50,000.**

—AIR CONDITIONING—U. S. Eng.,
tonio, air conditioning, Bexar Co., to
Engineering Co., 1901 Caroline St.,
under **$50,000.**

—CONSTRUCTION—U. S. Eng., San
addnl. temporary construction, Bexar
Trueheart, Caldwell & Lee, Builders
ge Bldg., San Antonio, under **$50,000.**

—FENCING—U. S. Eng., Fort Sam
fencing, facilities, Bell Co., to Burn-
onst. Co., Georgetown, under **$50,000.**

—IMPROVEMENTS—U. S. Eng., Al-
que, N. M., imprvs., addnl. bldgs., etc.,
Co., to H. B. Zachry Co., Laredo
x 596, San Antonio, **$100,000-$500,000.**

—IMPROVEMENTS—U. S. Eng., 231
n St., Denison, imprvs., Tarrant Co.,
B. Friedman, 1510 W. 10 St., Fort
$100,000-$500,000.

—TURFING—U. S. Eng., 25 St. and
F, Galveston, turfing, leveling, dirt
Brazos Co., to Cage Bros. and J. O.
& M. C. Winters, Bishop. **$50,000-**
00.

Elkhart — OIL WELL — Byrd-Frost,
Palestine, drilling, developing 5,300 ft.
il, to J. B. Daniel, Fairfield, approx.
CD 3/4—ENR 3/11.

—IMPROVEMENTS—U. S. Eng., 32
ge Pl., Salt Lake City, imprvs., bldg.
Weber Co., to P. H. Paulsen, 55½
So. St., Salt Lake City, under **$60,000.**
3/1.

shington—GASOLINE SYSTEM—U. S.
800 3 Ave., Seattle, gasoline sys., Grays
r, to J. W. Bailey Constr. Co., 228
N., Seattle, under **$50,000.**

shington — IMPROVEMENTS—Yards &
Navy Dpt., 18 St. and Constitution
N.W., Wash., D. C., imprvs., to Had-
Constr. Co., Pasadena, Calif. Est.
00.

shington—TREATING GROUNDS, etc.
S Eng., 800 3 Ave., Seattle, treating and
g grounds, etc., Pierce Co., to Foster &
r, 1675 Eddy St., San Francisco, Calif.,
$50,000.

azil—FUEL TANK FACILITIES, etc.—
& Docks, Navy Dpt., 18 St., and Con-
ion Ave. N.W., Wash., D. C., fuel tank
torage facilities at Recife and Sao Salva-
NOY 5820, to Standard Oil Co. of Brazil,
De Janeiro, **$229,950.**

orth West Territories and **Yukon**—PIPE-
INE, etc.—Dominion Govt., Ottawa, Ont.,
ni. pipeline to connect oil wells at Fort
an, NWT, with Whitehorse, Yukon Ter-
y, day labor, **$3,000,000-$3,500,000.** U. S.
will help finance. CD 6/3—ENR 6/11.

e., Capchats— TRANSMISSION LINE —
. Roy, municipality clk., transmission
etc., from Rimouski, to St. Lawrence
er Co., Rimouski. Est. **$30,000-$40,000.**

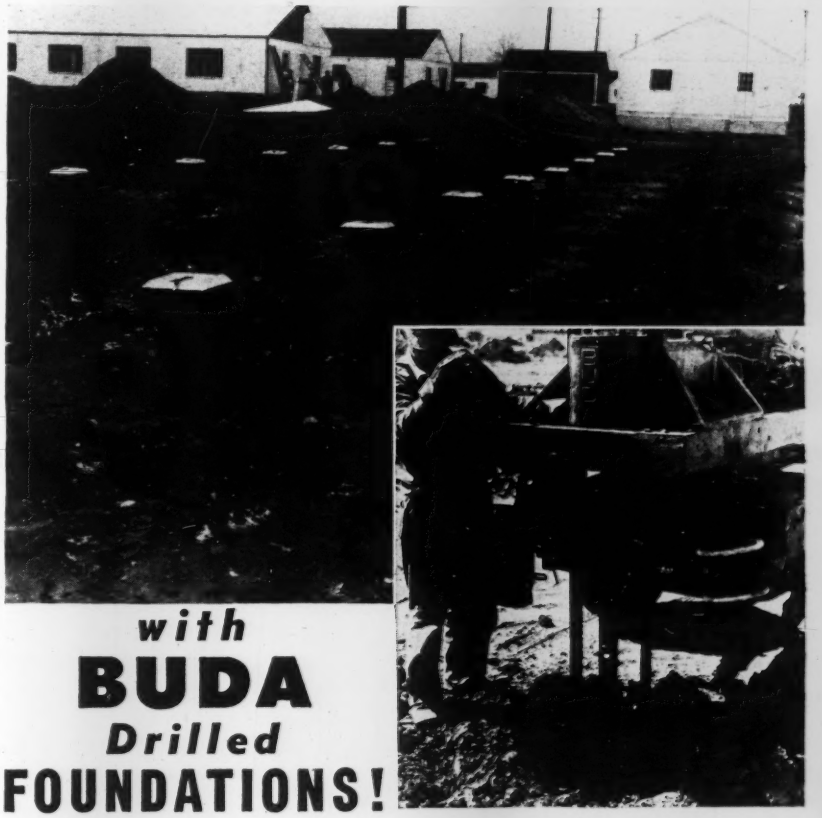
e., Ste. Anne de Monts—TRANSMISSION
E — J. C. Sasseville, municipality clk.,
mission lines from Rimouski, to St.
rence Power Co., Ltd., Rimouski. Est.
000.

PUBLIC BUILDINGS

OPOSED WORK

la., Huntsville—Federal Works Agency,
ler Bldg., Atlanta, Ga., plans by Charles
McCauley, Jackson Bldg., Birmingham,
entary and Jr. High School, Docket 1-244.

Speed Up DEFENSE HOUSING



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● **Precast Piles and Footings**

The complete accuracy of alignment, hole size and depth possible with the BUDA Earth Drill makes the setting of precast piles and footings a fast precision job. Forty times faster than hand methods, Buda-drilling will help you meet . . . and beat . . . hurry-up construction schedules.

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Buda-drilled holes are uniform and smooth-walled—most soils can be drilled without caving. No sub-surface forms are needed—reinforcing may be set and concrete poured immediately after the hole is completed. Skin friction is added to bearing values—so you get not only a *faster* foundation, but a *better* one as well!

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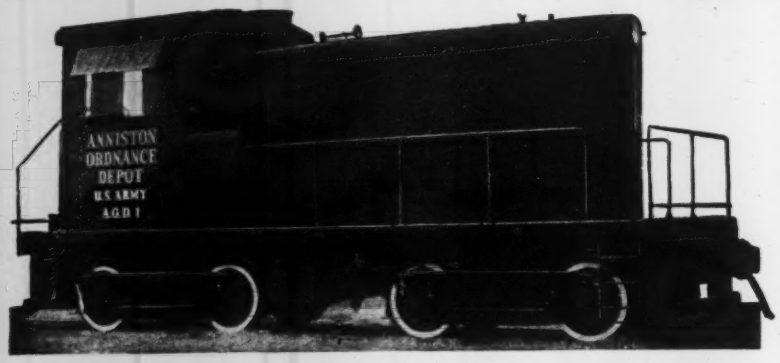
It TAKES POWER *to* WIN WARS



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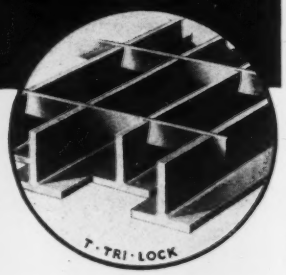

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REPRESENTATIVES IN PRINCIPAL CITIES

PUBLIC BUILDINGS (Proposed Work)

†**Arizona**—Pub. Housing Auth., Market St., San Francisco, Calif., camp, Ariz. 2313.

†**Arizona**—Pub. Housing Auth., Market St., San Francisco, Calif., Lescher & Mahoney, 1160 Title & Trust, Phoenix, family dwelling units, CD 3/11—ENR 3/18.

†**California** — Bethlehem Alameda Shipyard, Inc., 2308 Webster St., Alameda, San Federally financed.

†**California**—H. J. Kaiser Co., 1 Square Bldg., Oakland, Richmond Field Hospital addn., Contra Costa Co., erally financed.

★†**Connecticut**—Pub. Housing Auth., 24 School St., Boston, Mass., bldg. dormitories, Conn. 6058, Conn. 6059, and 6060. CD 3/2—ENR 3/4.

†**Connecticut**—Pub. Housing Auth., 24 School St., Boston, Mass., bldg. Mar. 11, brick, concrete pumping, Fairfield, Conn. 6022, 6023 and 6025. CD 2/25.

†**D. C., Wash.**—Alley Dwelling Auth., L St. N.W., 40 unit accommodations for ples, Obrian Court, D.C. 49062, 150 commodations for couples, Northolm Area, 49063, for NHA.

†**Fla., Avon Park**—Federal Works Agency, Candler Bldg., Atlanta, Ga., recreation, $20,000.

†**Indiana**—Whitley Products, Inc., Port ton, remodeling and constructing addns., terminal bldgs. $215,000. Defense Plant will finance.

†**Ind., Indianapolis** — Indiana University, School of Medicine, W. G. Liddle, secy., Trustees, Bloomington, sketches by Mayer & Shook, 1401 Fletcher Trust Bldg., 4 bsmnt., brick, rein.-con. medical center, home, W. Michigan St. $400,000. FWA.

†**Illinois**—Sundstrand Machine Tool Co., Rockford, addnl. plant facilities, $2,000,000. Defense Plant Corp. will finance.

†**Kansas**—U. S. Eng., 10 E. 17 St., Kansas City, Mo., bldgs., Shawnee Co. Under $1,000,000.

Kan., Kansas City—Providence Hospital, and Barnett Sts., plans by Carroll & Daily, R. A. Long Bldg., Kansas City, Mo., hospital addn. $275,000. Applied to FWA.

★†**Kentucky**—Tube Turns, Inc., 1 Bway., Louisville, plant facilities $6,000,000. Defense Plant Corp. will finance.

†**Louisiana**—Veterans Admin., Vermont between H and I Sts., N.W., Wash., D. C., bldg. alterations, addns.

†**Massachusetts**—Pub. Housing Auth., 24 School St., Boston, cancelled bids to have been opened Mar. 20, housing, Project 19028. Plans withdrawn. M. A. Dyer, 8 Beacon St., Boston, archt. CD 3/4—3/11.

†**Massachusetts**—Pub. Housing Auth., 24 School St., Boston, plans by Leard & Larsen, 814 Statler Bldg., Boston, temp. housing, Mass. 19083. CD 3/9—ENR 3/11.

★†**Michigan**—Chrysler Corp., 341 Mass., Detroit, addnl. plant facilities, $60,000,000. Defense Plant Corp. will finance.

†**Michigan**—Huck Mfg. Co., 3245 Wight, Detroit, addnl. plant facilities, $200,000. Defense Plant Corp. will finance.

★†**Missouri**—Curtiss-Wright Corp., Buffalo, N. Y., addnl. plant facilities, $825,000. Defense Plant Corp. will finance.

†**Nebraska**—U. S. Eng., 1709 Jackson, Omaha, rebuilding cafeteria bldg., Hall, $160,000 with equip.

†**New Jersey**—Farm Security Admin., Dept. Agriculture, The Mall between 12 and 14 Sts. S.W., Wash., D. C., 17 Brief Ave., Darby, Pa. several labor camps, Burlington Co.

†**New Mexico**—Pub. Housing Auth., NE 1309 Electric Bldg., Fort Worth, Tex., plans by Haynes, Strange, Parkhill, Voss & Dixon and J. Schaefer, 702 Main St., Lubbock, Tex., dormitory housing, N.M. 29131 and 3/24 postponed. CD 3/18—ENR 3/18.

★†**New York**—Curtiss-Wright Corp., Buffalo, addnl. plant facilities. Approx. $13,000,000. Defense Plant Corp. will finance.

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BUILDINGS (Proposed Work, Con.)

York—Republic Aviation Corp., ...in St., Farmingdale, building conver... ...achinery and equipment to sub-con... ...in various states. $10,000,000. De... ...nt Corp. will finance.

Niagara Falls—Niagara Falls Bd. ...iagara Falls, school. $136,700. **FWA.**

Cherry Point—Federal Works ...C., ...801 State Planters Bank Bldg., Rich... ...., plans by B. H. Stephens, New ...hool, N.C. 31-247. $75,000. CD 3/12—...lk.

Creedmoor—Granville Co., plans by ...axwell, Goldsboro, school, N.C. 31-230. ...FWA. CD 1/20—ENR 1/28.

Durham—Duke University, Durham, ...r G. F. Hackney, Durham, nurse's ...C. 31-241. $132,000. **FWA.** CD 2/8—...21.

...—Aviation Corp., Williamsport, ...l plant facilities. $630,000. Defense ...orp. will finance.

...on—U. S. Eng., Pittock Blk., Portland, ...matilla Co. $10,000.

...sylvania—Allegheny County Housing ...201 County Office Bldg., Pittsburgh, ...e by J. W. Hoover, Keystone Bldg., ...gh. Temporary housing and community ...., Pa. 36-302, for NHA.

...sylvania—Pub. Housing Auth., NHA, ...s., New York, N. Y., housing, Pa.

Lebanon—Veterans Admin., Vermont ...tween H and I Sts. N.W., Wash., D. C., ...s bldg.

...th Dakota—Pub. Housing Auth., 201 ...Wells St., Chicago, Ill., plans by J. F. ... and J. Ziegele, Beverly Theatre ...Peoria, Ill. associated with H. Spitz... ...Western Surety Bldg., Sioux Falls, ...nt unit housing, S. D. 39024 and ...dwelling housing S. D. 39027. CD 1/22 ...3 and ENR 1/28 and 1/21 respec...

..., **Murfreesboro**—Veterans Admin., ...t Ave. between H and I Sts. N.W., ...D. C., tuberculosis hospital addn., ...ions.

...as—Houston Housing Auth., Houston, ...verting family homes and other type ...into family dwellings; constructing ...mily dwellings, over $1,000,000; con... ...existing dwellings and similar types ...partment housing. CD 2/26—ENR 3/4.

..., **Victoria**—Victoria Ind. School Dist., ...school bldg. Over $150,000.

..., **Salt Lake City**—Federal Works ...Newhouse Bldg., detention hospital, ...ded jointly by state, county and city. ...FWA allot.

..., **Waupaca**—Wisconsin Adj. General ...t., Madison, plans by R. C. Kirchhoff, ...rcht., Madison, new boiler plant and ...t new hospital, at Veterans Home. ...

...ada—Canadian Peat Fuel Bd., Dpt. ...es, Ottawa, Ont., number peat proc... ...plants in vicinity of Ottawa (Afred),— ...al Toronto and other leading cities. ...,000.

..., **Brandon**—Municipality, civic audi... ...and technical school. $150,000 each.

...B., **Fredericton**—Municipality, abattoir. ...

...B., **Fredericton**—Province of New ...unswick rural composite high schools ...nlargement rural schools during 1943. ...,000 voted by Legislature.

...B., **St. John**—Secretary Dpt. Munitions ...Supply, Ottawa, Ont., bids soon naval ...ks, training center, to replace H.M.C.S. ...wicker, Prince William St., for Dpt. ...al Defense for Sea, Ottawa, Ont. About ...,000.

...S., **Kentville**—Municipality, new town ...nd fire station. $150,000.

..., **Galt**—C. T. Chesney, municipality clk., ...ity hall. $150,000.

..., **Kitchener**—Wartime Housing Ltd., 55 ...St., Toronto, bids soon 100 houses for ...o Housebuilding Ltd., Kitchener. $350,...

...k., **Regina**—Province of Saskatchewan, ..., power plans. $230,000 voted. Sas... ...ewan Power Comm., Regina, engrs.

..., **Windsor**—C. V. Waters, municipality ...ew city hall. $150,000.

..., **Windsor**—Salvation Army, 20 Albert ...oronto, plans by J. P. Thomson, 1191 ...ermere Rd., Windsor, Grace Hospital ... 339 Cranford St. $150,000.

ASKED

Bids Asked After March 20

...., **South Portland (br. Portland)**—Pub. ...ng Auth., NHA, 24 School St., Boston, ..., 1 story school, Me. 17031, Red Bank ...e, J. C. and J. H. Stevens, 187 Middle ...ortland, archts. CD 2/10—ENR 2/18.

Bids Asked After March 23

Mississippi—Pub. Housing Auth., NHA, ...15 Georgia Savings Bank Bldg., Peach... ...and Broad Sts., Atlanta, Ga., family ...ing units Miss. 22030. $500,000. Plans ...et $50. Landry & Matthes, 218 W. Pine ...Hattiesburg, archts. CD 3/9—ENR 2/18.

Mississippi—Pub. Housing Auth., NHA, ...Georgia Savings Bank Bldg., Peachtree ...Broad Sts., Atlanta, Ga., dormitory hous... ...Miss. 22150. $1,000,000. Plans deposit ...Landry & Matthes, 218 W. Pine St., ...esburg, archts. CD 3/12—ENR 3/18 ...r BA.

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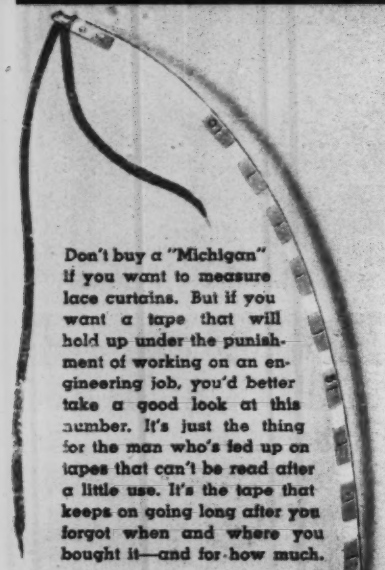

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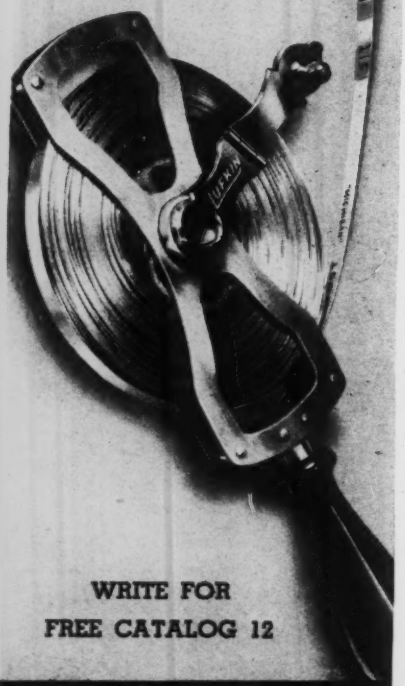

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PUBLIC BUILDINGS (Bids Asked, Cont'd.)

Bids Asked After March 25

†**Md., Cedar Point**—Pub. Housing Auth., NHA, Tempory Bldg. 2, 19 and D St. N.W., Wash., D. C., housing, Projects Md. 18192 and Md. 18255, Ely Jacques Kahn and Robert Allan Jacobs, 2 Park Ave., New York, N. Y., archts. CD 3/22.

Bids Asked March 29

†**Conn., Niantic**—Federal Works Agency, 99 Chauncy St., Boston, Mass., office and recreation bldg. $23,000. CD 3/16—ENR 3/18.

†**Massachusetts**—Pub. Housing Auth., NHA, at Alderman's Offices, City Hall, Holyoke, 17 bldgs., 112 unit dwellings, 1 community house, 1 shop and garage, utilities, overhead electric distr., Mass. 19080. Plans deposit $50 first set, $10 each addnl. set. Tighe & Bond, 189 High St., Holyoke, archts. and engrs.

†**Massachusetts**—Pub. Housing Auth., NHA, 24 School St., Boston, dwelling housing, Mass. 19029. Plans deposit $50 first set and $10 each addnl. set. J. M. Gray, 175 High St., Boston, archt. CD 3/18—ENR 3/11.

Bids Asked March 30

†**Connecticut**—Pub. Housing Auth., NHA, 24 School St., Boston, Mass., dwelling units, community bldg., utilities, Conn. 6181, site imprvs., etc., Conn. 6183. Plans deposit $50 1st set, $10 each addnl. set. CD 3/9—ENR 3/11.

★†**Connecticut**—Pub. Housing Auth., NHA, 24 School St., Boston, Mass., dormitories, Conn. 6058, Conn. 6059 and Conn. 6060. Plans deposit $50 1st set, $10 each addnl. set. CD 3/22—ENR 3/25.

†**Georgia**—Pub. Housing Auth., NHA, Georgia Savings Bank Bldg., Peachtree and Broad Sts., Atlanta, family dwellings, appurtenant facilities, Ga. 9057. Plans deposit $50. CD 2/26—ENR 3/4.

†**Indiana**—Pub. Housing Auth., NHA, 201 N. Wells St., Chicago, Ill., commercial bldgs., school and administration group, 1 story, frame, brick construction. A. D. Taylor & Associates, 4614 Prospect St., Cleveland, O., archts.

†**Massachusetts**—Pub. Housing Auth., NHA, 24 School St., Boston, housing, Mass. 8-1. Plans deposit $50 first set and $10 each addnl. set. Charles L. Maguire & Associates, 1515 Turks Head Bldg., Providence, engrs. CD 3/18.

†**Pa., Greenville**—Pub. Bldgs., Admin., North Interior Bldg., Wash., D. C., recreation bldg., No. 36-196. **FWA.** Extended date. CD 3/4—ENR 12/31.

†**Wis., Cuba City**—Dpt. Agriculture, Hemp Div., Commodity Credit Corp., The Mall, 12 to 14 Sts. S.W., Wash., D. C., hemp mill. $145,000. CD 3/3—ENR 3/11.

†**Wis., De Forest**—Dpt. Agriculture, Hemp Div., Commodity Credit Corp., The Mall, 12 to 14 Sts. S.W., Wash., D. C., hemp mill. $145,000. CD 3/3—ENR 3/11.

†**Wis., Hartford**—Dpt. Agriculture, Hemp Div., Commodity Credit Corp., The Mall, 12 to 14 Sts. S.W., Wash., D. C., hemp mill. $145,000. CD 3/3—ENR 3/11.

Bids Asked March 31

†**D. C., Wash.**—Alley Dwelling Auth., 1737 L St. N.W., housing, Project DC-49060, for NHA. Extended date. CD 3/16—ENR 3/18.

Md., Baltimore—Bd. Awards, City Register's Office, City Hall, 1 story, 60x220 ft. Curtis Bay School, No. 70-A, Cambria St. and Alton Ave. $132,000. Plans deposit $100. W. F. Stone, Jr., 2612 N. Charles St., archt.

†**Massachusetts**—Pub. Housing Auth., NHA, 24 School St., Boston, dormitory housing, Mass. 19082, altering Harrington Cutlery Co. factory. Plans deposit $50 first set and $10 each addnl. set. Leland & Larsen, 814 Statler Bldg., Boston, archts. CD 3/15—ENR 3/18.

Bids Asked April 1

†**Texas**—Pub. Housing Auth., NHA, 1309 Electric Bldg., Worth, dormitory accommodations, Tex. 41556, and dwellings, Tex. 41557, and Tex. 41558. W. C. Hedrick, 1005 First Natl. Bank Bldg., Fort Worth, archt. CD 3/8—ENR 3/11.

★**Que., Montreal**—Secy. Dpt. Munitions & Supply, Ottawa, Ont., 28 bldgs., incl. quarters, recreation hall, etc. for Dpt. National Defense, Ottawa, Ont. $600,000.

Bids Asked After April 1

†**Me., Presque Isle**—Pub. Bldgs. Admin., North Interior Bldg., Wash., D. C., federal recreation bldg. FWA; Adv. ENR 3/25. CD 12/4—ENR 12/10.

Bids Asked April 2

†**N. Y., Canandaigua**—Veterans Admin., Vermont Ave., between H and I Sts. N.W., Wash., D. C., N.P. infirmary bldg. and connecting corridors. $250,000. Extended date. CD 2/26—ENR 3/4.

†**Texas**—Pub. Housing Auth., NHA, 1309 Electric Bldg., dormitory apartment housing, Tex. 41112, and dwelling units, Tex. 41113-4. Extended date. Giesecke, Kuehen & Brooks, Littlefield Bldg., Austin, archts. CD 3/18—ENR 3/4.

Bids Asked April 3

†**Texas**—Pub. Housing Auth., NHA, 1309 Electric Bldg., Fort Worth, dwellings, Tex. 41550, and dormitory housing, Tex. 41551. Grayson-Gill, Great Natl. Life Bldg., Dallas, archts. CD 3/16—ENR 3/18.

Bids Asked April 5

†**South Carolina**—Pub. Housing Auth., NHA, Georgia Savings Bank Bldg., Peachtree and

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BUILDINGS (Bids Asked, Cont'd.)

Sts., Atlanta, Ga., family dwellings, ...rtenant facilities, S.C. 38054. Plans $50. LaFaye, LaFaye & Fair, 1226 St., Columbia, archts. CD 2/26—4.

Bids Asked April 5

...—Pub. Housing Auth., NHA, 1309 ... Bldg., Fort Worth, dormitory hous- ... Bldg., and family housing, Tex. ...ex. 41521, and family housing, Tex. ... Extended date. Pitts & MacPherson, ... Natl. Bldg., San Antonio, archts. CD ...NR 3/11.

Bids Asked April 6

...land—Pub. Housing Auth., NHA, Tem- ...Bldg. 2, 19 and D Sts. N.W., Wash., ...using, Md. 18261, and family dwellings, ...50. CD 3/3—ENR 3/11.

Bids Asked About April 13

Coatesville—Veterans Admin., Ver- ...Ave., between H and I Sts. N.W., Wash., ... Infirmary Bldg. 57. Extended date. ...e Eng. Corp., 101 Park Ave., New ... Y., taking sub-bids. CD 2/3—...11.

Bids Asked April 14

Portsmouth—Federal Works Agency, ...te Planters Bank Bldg., Richmond, 2 ...frame addn. recreation center for USO. ... Plans deposit $5. T. David Fitz ... Royster Bldg., Norfolk, archt.

Bids Asked May 18

...**Bedford**—Veterans Admin., Vermont ...tween H and I Sts. N.W., Wash., D. C., ... Bldg. 4 addns.

Bids Asked

...**Aberdeen**—Pub. Bldgs. Admin., North ...r Bldg., Wash., D. C., 60x190 ft., brick, ... block school, Md. 18-196, for Harford ... School Bd. **FWA.** Taylor & Fisher, ... Calvert St., Baltimore, and A. Shaw, ... archts.

...sachusetts—Pub. Housing Auth., NHA, ...hool St., Boston, housing, Mass. 19027. ... H. Ritchie & Associates, 20 Newbury ...oston, archts. CD 3/16—ENR 3/18 un- ...A.

...xas—U. S. Eng., 25 St. and Avenue F, ...ston, bldg., Solic 359-43-C-58, in part, ...tone Co.

...xas—U. S. Eng., Fort Worth, bldgs., ...es, Dallas Co. Over $40,000.

...xas—U. S. Eng., 25 St. and Avenue F, ...ston, bldg., Solic. 359-43-C58, in part, ...tson Co. Over $40,000. Plans deposit

...xas—U. S. Eng., 25 St. and Avenue F, ...ston, bldg., Solic. 359-43-C58, in part, ...r Co. Over $40,000. Plans deposit $25.

BIDDERS

...lifornia—U. S. Eng., 1209 8 St., Sacra- ...o, bldg., Spec. 464, Stanislaus Co., from ...hitt-Shields & Fisher, Pacific Southwest ..., Fresno, **$395,919.** CD 3/12.

...Calif., Vallejo—Pub. Bldgs. Admin., North ...terior Bldg., Wash., D. C., Mar. 16, bldg., ...4461, from Barrett & Hilp, 918 Harrison ... San Francisco, **$1,070,000. FWA.** CD

...Delaware—Pub. Housing Auth., Temporary ...Bldg. 2, 19 and D Sts. N. W., Wash., ...C. Mar. 19, apartment, family housing, ... Del. 7035, from Hadley Contr. & Constr. ..., 1213 Wood St., Phila., Pa., **$1,248,000.** ...3/16—ENR 3/4.

... C., Wash.—Alley Dwelling Auth., 1737 ... N.W., Mar. 13, D. C. 415, addns. Fort ...nt dwellings, for NHA, from Eugene ...son & Co., Alexandria, Va., **$324,944.** ...3/11—ENR 3/11.

...d., Franklin—Pub. Bldgs. Admin., North ...rior Bldg., Wash., D. C., Mar. 16, federal ...ation bldg., Ind. 12-188, from Frank A. ...idt Constr. Co., 9218 S. Cottage Grove ..., Chicago, Ill., **$37,440. FWA.** CD 3/9— ... 3/11.

...Md., Cheverly—Federal Works Agency, 18 ...and F Sts. N. W., Wash., D. C., Mar. 19, ...ital and nurses home, Md. 18-148, from ... Turner, 3616 14 St. N. W., Wash., D. C., ...537. CD 3/3—ENR 3/11.

...Oklahoma—U. S. Eng., 416 Wright Bldg., ...a. bldgs., facilities, grading, Muskogee ... from R. A. Hughes Constr. Co., Fayette- ..., Ark., $100,000-$500,000. CD 2/26—ENR

...Texas—Pub. Housing Auth., NHA, 1309 ...tric Bldg., Fort Worth, Mar. 19, dwell- ..., Tex. 41531 and 41532, from Ball-McCann ...t. Co., 300 S. Main St., Fort Worth, ...,900. CD 3/12—ENR 3/11.

...Texas—U. S. Eng., 25 St. and Avenue F, ...veston, Mar. 15, bldgs., utilities extens., ...c 359-43-C54, McLennan Co., from W. L. ...man & Son, 1038 Hendricks St., Dallas, ...,000-$100,000. CD 3/11.

...Va., Arlington—Pub. Bldgs. Admin., ... North Interior Bldg., Wash., D. C., Mar. ... hospital and nurses home, N. 16 St., near ...e Hy., Proj. Va 44130, from Monahan-Mc- ...n Corp., 101 Park Ave., New York, N. Y., ...6,000. **FWA.** CD 3/2—ENR 3/4.

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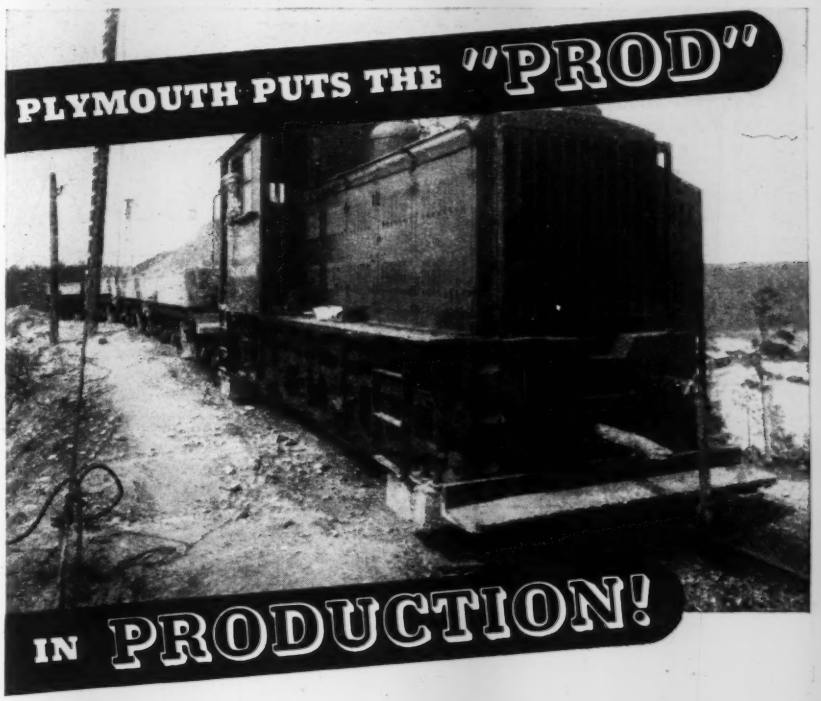

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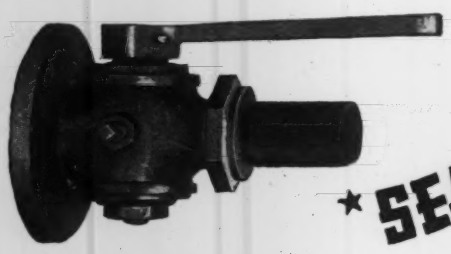

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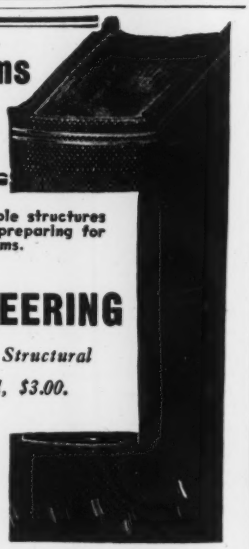

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PUBLIC BUILDINGS

†**Va., Warrenton**—U. Sts. N.W., Wash., D. & Garrett, 1719 I St. N

†**Washington**—Pasco Mar. 15, housing, from Salem, Ore., **$196,709.**

CONTRACTS AWARDED

†**Alabama** — Pub. H Georgia Savings Bank Broad Sts., Atlanta, ing, Ala., 1123, to T. Anniston. Charles H. Bldg., Birmingham, ar 1/21.

†**Alabama**—U. S. Eng., Atlanta Ga., addnl. bld Daniel Const. Co., 824 7 over **$150,000.**

†**Alabama**—U. S. Eng., Customhouse, Mobile, bldg 552, Mobile Co., to Edgel dict Pl., Mobile. Est. **$40,9**

†**Alabama**—U. S. Eng., Customhouse, Mobile, addn 43-547, Mobile Co., to F American National Bank Tenn. Over **$250,000.**

†**Arizona**—U. S. Eng., Los Angeles, Calif., line utilities, Mohave Co., to D Co., S. 23 Ave., Phoenix, under **$50,000.**

†**California** — U. S. Coast Guard, House, San Francisco, 1 frame warehouse, pile and Nielsen, Erbentraut & Sum Francisco. Est. **$100,000.** F. W House, San Francisco, Senior Civil Eng.

†**California**—U. S. Eng., 74 New Mont St., San Francisco, altering bldgs., Co., to Cahill Bros., 206 Sansome St., Francisco; electrical work, to Spott Co., 569 19 St., Oakland.

†**California**—San Joaquin County Auth., 123 N. El Dorado St., Stockton, tory units, Cal.-4064; and family units, Cal.-4065-4066, for NHA, to & Green, 309 First National Bank Stockton. **$325,000.**

†**California**—U. S. Eng., 74 New Mont ery St., San Francisco, housing, Monterey, to Howson Bros., Gilroy. Awarded 3/11.

†**Calif., Richmond**—U. S. Maritime Financial Center Bldg., Oakland, mar bldg. to M. J. King, 251 Franklin St., Francisco; electrical work, to Spott Co., 576 22 St., San Francisco.

★†**Del., Wilmington**—Pub. Housing A NHA, Temporary Bldg. 2, 19 and D N.W., Wash., D. C., 250 family dwelling and 120 accommodations for couples, 7036, to Anthony P. Miller, 3333 Arctic Atlantic City, N. J., **$778,900.** awarded 100 family dwelling units and 48 accom tions for couples, Del.-7034, to J. Bisco Sons, Inc., Biltmore Theater Bldg., Harr N. Y., **$343,900.** Bids 2/11, awarded CD 2/1—ENR 2/4.

†**Florida**—U. S. Eng., U. S. Courthou Post Office, Jacksonville, terminal, Neg 43-26, Dade Co., to Frank J. Rooney N.E. 116 St., Miami, under **$50,000.** Awa 2/23.

†**Florida**—U. S. Eng., U. S. Courthou Post Office, Jacksonville, boiler house loading rack, steam facilities, Neg-Jax 611, Duval Co., to Industrial Heating Plumbing Co., Yukon, under **$500,000.** Awa ed 2/23.

†**Florida**—U. S. Eng., U. S. Courthou Post Office, Jacksonville, boiler house, facilities, Neg-Jax-43-621, Bay Co., to C Guest & Sons, Henderson, S. C., under $50, Awarded 3/2.

†**Florida**—U. S. Eng., U. S. Courthouse & Office, Jacksonville, bldg., Inv. Neg-MD-43 Hillsborough Co., to R. E. Clarson, Inc., Pa & Light Bldg., St. Petersburg, less **$50,000.** Awarded 3/4.

†**Georgia**—U. S. Eng., 494 Spring St. N Atlanta, Sect. 4, power house appurten and steam distr., to Grinnell Co., 240 N. Ba land Ave., N. E., Atlanta, Ga.; Sect. 1, side electrical distr., Floyd Co., to Guy T send Co., Jackson, Miss. Bids 3/11. 3/19 under CA.

★†**Georgia**—U. S. Eng., 494 Spring St. N Atlanta, bldg., Floyd Co., to A. Ba Decatur. Total cost less than $2,000,0 Bids 3/11.

†**Georgia**—U. S. Eng., Post Office Bl Savannah, bldg., Houston Co., to Murp Pound Const. Co., Hill Bldg., Columbus.

†**Illinois**—U. S. Eng., 520 Merchandise M Chicago, Ill., miscellaneous bldgs., Cook to Goodwin Constr. Co., 320 S. Spaulding A Chicago.

†**Illinois**—U. S. Eng., 520 Merchandise M Chicago, bldgs., utilities, Cook Co., to C & Anderson, Inc., 176 W. Adams St., Chica **$100,000-$500,000.**

†**Illinois**—U. S. Eng., 520 Merchandise M Chicago, addnl. temporary construction ce cellaneous bldgs. and installing cold stor units, Lawrence Co., to Welso Constr. 2233 N. Grand Ave., Chicago, **$100,000-$5 000.**

★†**Illinois**—Pub. Housing Auth., NHA. N. Wells St., Chicago, dormitory ap ment housing, Ill. 11033, and 2 family dw ings, Ill. 11034, to T. S. Willis, Janesv Wis. **$880,000.** Awarded 3/16. CD 2/ ENR 3/4.

†**Louisiana**—U. S. Eng., 25th St. and Ave F, Galveston, Tex., supplemental contract addnl. bldg. facilities, Orleans Parish.

BLDGS. (Contracts Awarded, Cont'd.)
F. Favrot, Balter Bldg., New Orleans,
0,000.

siana—U. S. Eng., 25 St. and Avenue
alveston, Tex., imprvs. (W-359-43-
storage, to G. F. Favrot, Balter Bldg.,
eans, est. under **$1,000,000.**

land—Pub. Housing Auth., NHA,
ry Bldg., 2, 19 and D Sts. N.W.,
D. C., inside electrical work for hous-
ject Md. 18162, to Goodrie Electric
hmond, Va.; outside electrical work,
dway Maintenance Corp., 47-47 35 St.,
land City, N. Y. CD 1/27—ENR 2/4
A.

land—Glenn L. Martin Co., Middle
rick, concrete storage bldg., to Con-
Eng. Co., 20 E. Franklin St., Balti-
Federally financed. Albert Kahn
Engrs. & Archts., 345 New Center
Detroit, Mich., archts.

igan—U. S. Eng., 700 Union Guardian
Detroit, recreation bldg. and chapel,
ities, Washtenaw Co., to C. N. Board,
riotot St., Detroit, less than **$1,000,000.**

igan—Pub. Housing Auth., NHA, Bar-
ower, Detroit, site imprvs., utility
or trailer project No. 20-113, to O. W.
Co., 1010 Fisher Bldg., Detroit. Maier
Assoc., 13124 Shaker Sq., Cleveland,
t.

higan—U. S. Eng., 700 Union Guard-
Bldg., Detroit, hospital recreation
covered walk, utilities, Chippewa Co.,
H. Proksch, Iron River, less than **$1,-**

, Saginaw — F. K. Anderson, chn.
Com., Saginaw General Hospital, hos-
addns., alterations and new nurses'
Mich. 20-125, to Weikel Constr. Co.,
rmers Tr., Fort Wayne, Ind., **$387,000.**
Bids 3/2. CD 3/9—ENR 3/11, under

issippi—Pub. Housing Auth., NHA, 615
Savings Bank Bldg., Peachtree and
Sts., Atlanta, Ga., family dwellings,
2030, to Gravier & Harper, Alexandria,
47,815. Awarded 3/20. CD 3/17—ENR

souri—U. S. Eng., 10 E. 17 St., Kansas
Mo., addnl. bldg. facilities, St. Louis
J. Emil Anderson & Son, 3659 Belle
Ave., Chicago, Ill. Est. **$100,000-**
0. Horner & Shifrin, Shell Bldg.,
ocust St., St. Louis, engrs.

raska—U. S. Eng., 1709 Jackson St.,
bldgs., Hall Co., to Geer-Mauerer
Co., Grand Island. Est. under **$500,000.**

ev., Hawthorne—Yards & Docks, Navy
., 18 St. and Constitution Ave. N.W.,
D. C., addnl. facilities, NOY 5401,
mentary Agreement 4, to Wm. P. Neil
., 4814 Loma Vista Ave., Los Angeles,
,203,300. Awarded 3/10. Additional
10/28—ENR 11/5, under CA.

w Mexico—U. S. Eng., Albuquerque, re-
ation facilities, Hidalgo Co., to E. S.
s Eng. Co., 2125 Texas St., El Paso,
under **$50,000.** Awarded 3/18. CD 3/8
R 3/11.

w Mexico — U. S. Eng., Albuquerque,
housing, technical facilities, Curry Co.,
Millan & Glover, Lubbock, Tex., **$100,-**
00,000.

io—Pub. Housing Auth., NHA, 9 St. and
ect Ave., Cleveland, temporary farm
housing, Ohio 33181, to Chas. H. Shook,
582 W. 2 St., Dayton, **$305,890.**

Ohio—Cleveland Metropolitan Housing
ath., 9 St. and Prospect Ave., Cleveland,
side Park housing, Project Ohio 33076,
HA, to N. Fish Constr. and M. L. Bein,
Prospect Ave., Cleveland, **$1,545,000.**
days). CD 2/25—ENR 3/4 under LB.

nnessee—U. S. Eng., 494 Spring St. N.W.,
a, Ga., bldg. facilities, utilities, Dyer
o Building Constructors, Inc., Memphis,
00-$500,000.

Texas—Defense Plant Corp., 103 Emile
., Houston, armament plant, to South-
rn Constr. Co., 3802 Calhoun St., Hous-
approx. **$1,250,000.** Awarded 3/12.

xas—Dow Chemical Co., Freeport, chem-
etc., mfg. plant, to Stone & Webster,
merce Bldg., Houston, **$335,000.** Defense
Corp. will finance.

Texas—Monsanto Chemical Co., Texas
ity, addnl. bldgs., facilities for chemical
plant, force account and sub-contracts.
,000. Defense Plant Corp. will finance.
/25—ENR 3/4.

xas—U. S. Eng., 231 W. Main St.,
on, addnl. bldgs., Bowie Co., to Munn
r. Co., 5319 Junius St., Dallas, **$100,000-**
00.

xas — U. S. Eng., Fort Sam Houston,
facilities, Brown Co., to Yarbrough
r. Co., 410 Navasota St., Austin, over
00.

xas—U. S. Eng., Fort Sam Houston,
Kinney Co., to L. Christy, 503 Builders
ange Bldg., San Antonio, under **$50,000.**

xas—U. S. Eng., Fort Sam Houston,
emental contract addnl. bldgs., facilities,
rground utilities, Brown Co., to Yar-
h Constr. Co., 410 Navasota St., Austin,
ox. **$268,000.**

xas—U. S. Eng., 231 W. Main St., Deni-
addnl. bldgs., facilities, Lamar Co., to
C. Dyer, Dallas Gas Bldg., Dallas,
00-$500,000.

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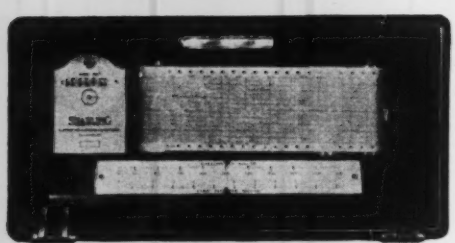

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PUBLIC BLDGS. (Contin... Awards)

★**†Va., Alexandria**—I... Bldgs. A... North Interior Bldg... Wash., D... temporary dormitory ... bar... Arlington Co., to Graha... Bros. Mech... 9 and Main Sts., Richm... $1,720,000.

†Washington — U. S. ... Portland, Ore., bldgs., ... Walla Co., to W. C. S... & Howard S. Wright & ... bia St., Portland, Ore., $...

★**†Washington** — Ev... Medical and Dental B... anent housing, Project ... Mullen & Strand, 3939 ... attle, **$748,000.** CD 2/1... LB.

†Washington—U. S. E... attle, bldgs., Snohomish ... Constr. Co., 6519 53 Ave. N.E., Seattle, **$50,000.**

†Wisconsin—Wehr Steel ... Ave., 2 story, 72x94 ft., ... concrete fdn. to Gebhard-Berghamm... 5420 W. State St., Milwaukee. ... financed. Est. **$50,000.** Bids 3/12. C... —ENR 3/11.

COMMERCIAL BUILDINGS

PROPOSED WORK

Conn., New Haven—William M. H... Co., 205 Church St., garden type apt... group, Whitney Ave. Over $250,000.

Md., Middle River—Thos. Mullan & ... 3945 Greenmount Ave., plans by ... Mills, 1822 Eye St. N.W., Wash., D.C., ... apartments.

N. J., Elizabeth—Garden Victory H... 658 Dusquesne Terrace, Union, plans by ... Silverstein, 24 William St., Newark, ... story, brick veneer, concrete block, ... unit apartments. $480,000.

O., Newark—Woodside Development ... Newark, plans by C. L. and C. Curtis ... 145 N. High St., Columbus, 156 unit ... Eddy and Hoover Sts.

Wash., Seattle—Olympic Constr. Co., ... and 33 Ave. S., plans by Stuart & Du... 4 and Cherry Bldg., 100 frame houses, ... St. and 34 Ave. S. $450,000.

N. B., St. John—Famous Players Can... Corp., St. John, theatre, King Sq. $200,000.

Ont., Clarkson—British American Oil ... Ltd., Royal Bank Bldg., Toronto, 30 ... ployees houses on Ryrie Farm, Clarkson ... road. $183,500.

Ont., Kitchener—Honsberger Home Bu... 58 Ontario St. S., 95 brick veneer houses, ... den and Pelz Aves., Charm, Lancaster ... Arnold Sts. $300,000.

Ont., Ottawa—F. J. Shovedice, 93 Sp... Ave., 80 dwellings. $320,000.

Ont., Windsor—Metropolitan General H... tal Bd., 1995 Lens Ave., sketches by ... Pennington, Bank of Commerce Bldg., ho... addn. $175,000.

Que., Montreal—Association Catholi... l'Aide aux Infirmes, 4347 St. Denis St., ... for epileptics, Ile aux Cerfs, St. Charles ... le Richelieu. About $200,000.

★**Que., Sorel**—Reverend Sisters of Ch... St. Hyacinthe, Que., new hospital, $... 000.

CONTRACTS AWARDED

★**Calif., San Bernardino** — McCray-Jo... Bldg. Corp., 5507 E. Ashworth St., ... flower, three hundred sixty-three 5 ... frame defense dwellings. Owner is ... Approx. **$1,250,000.** Walker & Eisen, 1... 6 St., Los Angeles, archt.

★**Calif., San Pablo**—Bohannan & Chan... lain, 859 San Mateo Dr., San Mateo, ... hundred 5 and 6 room frame resi... owner builds; electrical work, to H. L. ... mings Ralph Ave., Crockett. Est. $3,...

★**Conn., Bridgeport**—Owner, c/o He... Burmeister, archt., 90-50 Parsons B... Jamaica, N. Y., 200 apartments, 2 story ... crete, brick, **$2,000,000.** Owner builds.

Md., Brooklyn (Sta. Baltimore)—Bro... Apartments, Inc., 3108 Munsey Bldg., ... apartments, 10, Hall, Jack and Jeffrey St... Columbia Constr. Co., Munsey Bldg., B... more. Est. **$375,000.** Kenneth C. Miller, ... Newland Rd., Baltimore, archt.

Md., Baltimore—Loch Bend Apt. Corp., ... L. A. Menefee, archt., 306 N. Charles ... thirty-six 4 family apartment units, ... Rd. at Loch Ravan Blvd., to Colwill ... Tovall, Inc., 2114 Maryland Ave.

O., Berea—Garden Homes, Inc., c/o A... Taft, 140 Front St., and L. T. Blackman, ... Gibson St., Berea, forty 4 room, 24x3... frame defense houses, **$200,000.** Owner is ... Mellenbrook, Foley & Scott, 26 Front ... archts.

O., Cleveland—Louis Luxenburg, 2690 E... hill Rd., thirty 5 room masonry dwel... separate Contracts. **$180,000.**

O., Euclid—Finbar Homes, Inc., c/o A... Bauer, 18105 Hiller Ave., Cleveland, th... room frame defense homes, separate ... tracts. **$150,000.**

Tex., San Antonio—H. C. Thorman, ... Main St., twenty 2 story, brick veneer, ... dwellings, force account. **$175,000.** CD ... ENR 3/18.

POSED WORK

lif., Selby — PLANT, etc. — American ting & Refining Co., rebuilding eastern main plant bldg. and half dozen small $100,000.

d., Indianapolis—PLANT—Allied Bitumi- Products, 2100 S. Harding St., rebuild- plant, $40,000 or more with equip.

d., Marion — PLANT — Paranite Wire & Co., D. Carpenter, genl. mgr., rebuild- main plant bldg. $200,000 or more incl.

d., Marion—PLANT—Producers Creamery Railroad Ave., rebuilding part of plant. 00 or more incl. equip.

d., Baltimore—MACHINE SHOP—Balmar C. D. Heubeck, in charge, Clipper Rd., berry, 1 story, 60x180 ft., steel machine concrete fdn. $50,000.

eb., Gothenburg—PLANT—Denver Alfalfa ing Products Co., Lexington, dehydrating t. $50,000.

J., Livingston—GARAGE, etc.—De Camp Lines, 49 W. Mt. Pleasant Ave., plans by ard Wands, 309 Bloomfield Ave., Caldwell, ory concrete block bus garage and ma- e shop addn. $40,000.

kla., Tulsa—PLANT—Mid-Continent Petro- n Corp., Mid-Continent Bldg., Tulsa, sur- ng for replacement destroyed portion re- y plant. Over $40,000.

ex., Mission—PLANT—Hale County Foods Plainview, constructing, equipping vege- e dehydration plant, $72,000.

Va., Marion—PLANT—Virginia Lincoln Furniture Corp., Marion, L. Deville, secy., uilding 2 story plant unit. Est. $1,000,000.

Va., South Boston—PLANT—South Boston mber and Builder's Corp., South Boston, uilding planing mill.

Wis., Ladysmith—CREAMERY—Ladysmith k Producers Corp., 1 story, 45x180 ft., ck, tile addn. to creamery for spray drier.

Wis., Portage—PLANT—Portage Wholesale Portage, plans by Law, Law & Potter, S. Pickney St., Madison, remodeling 1 y, 85x132 ft. brick bldg., 1 story, 35x60 ft. crete bldg. addn., also 2nd story to 60x66 brick, tile garage.

Wis., Turtle Lake—PLANT—Turtle Lake op. Creamery Assn., Turtle Lake, plans Klinger & Hubbard, 218 S. Barston St., Claire, remodeling 1 story, 25x160 ft. k plant addn., brick, tile, also remodeling er room.

B. C., Naramata—PLANT—Naramata Co- rative Growers Exchange, Naramata, plans pared concrete stucco plant, concrete fdn. 7,900.

B. C., Tadanac—PLANT—Con. Mining & elting Co. of Canada, Ltd., Trail, remodel- plant. $100,000.

B. C., Vancouver—PLANT—Hope Lumber Ltd., 209 Rogers Bldg., saw mill and ed plant construction.

B. C., Vancouver—PLANT—Surrey Dome Oil Gas Co., Ltd., 402 W. Pender St., bldgs., ip. for developing claims, $70,000.

B. C., Victoria—PLANT—Owner, c/o Dpt. P. Wks., Victoria St., plant, $2,000,000. minion Govt. will finance.

B. C., Woodfibre—PLANT—B. C. Pulp & per Co., Ltd., 602 W. Hastings St., Van- uver, bids soon plant. $60,900. CD 9/24.

Man., St. Boniface — ABATTOIR — R. L. uchon, 140 Walnut St., Winnipeg, abattoir, 0,000.

Ont., Beamsville — WAREHOUSE—Bartlett inning Co., Beamsville, enlarging plant to vide addnl. warehouse or storage space.

Ont., Toronto—FACTORY—Cameron Equip- nt Co., Ltd., c/o R. H. Cameron, 12 Wells ill. factory, $40,000.

Ont., Toronto—MINE DEVELOPMENT— amont Mines, Ltd., c/o E. P. Groh, 171 nge St., mine development, necessary bldgs., uip. $50,000 (initial).

Ont., Toronto—PLANT—Noval Industries, d., c/o J. A. McNevin, 23 Beechwood Ave., ten. plant, $40,000.

Ont., Toronto—PLANT—Oakwood Iron Wks., d., c/o E. L. Sparling, 62 W. Richmond St., ocessing, grinding, forging and casting plant. 0,000.

Ont., Toronto—PLANT—Park Manor Uni- rms Ltd., c/o L. Schop, 371 Shaw St., cloth- g mfg. plant, $40,000.

Ont., Toronto—PLANT—Slatcher Eng. Co., td., c/o E. L. Sparling, 62 W. Richmond t., forging-casting plant and mfg. plastic oducts, machinery, tools, etc. $50,000.

Que., Montreal—SHOPS—Canadian Pacific y. Co., J. E. Armstrong, ch. engr., Windsor tation, alterations, etc., at Angus Shops. 11,000.

Que., Montreal — SHOP — Crane, Ltd., 380 t. Patrick St., pipe shop, incl. two 5 ton anes, 6 jib cranes and finishing c.i. floors nd boiler plant power sub-station. $376,000. . Pringle & Son, Ltd., 485 McGill St., engrs.

Que., St. Michel—GARAGE, etc.—Canadian uarry, Ltd., 2151 St. Michel Rd., garage, achine and tool shops, sheds. $100,000.

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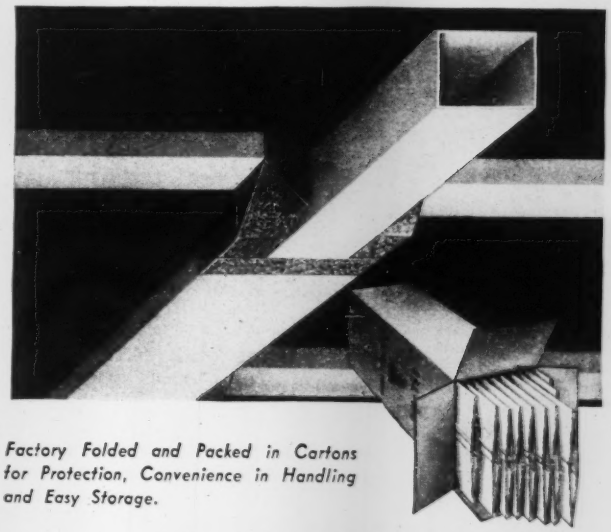

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INDUSTRIAL BUILDINGS (Cont'd.)

BIDS ASKED

La., Opelousas—PLANT—Opelousas Dehydration Corp., constructing, ... potato dehydration plant. $4[illegible] ...

Okla., Bartlesville—PLANT—Phillips Petroleum Co., c/o F. Phillips, Bartlesville, ... catalytic plant unit.

LOW BIDDERS

Calif., Alameda—SHOP, etc.—United Engineering Co., foot of Main St., ... Mar. 12, ... story, 60x200 ft., frame sheet metal shop, drafting room and women's locker room bldg., from M. J. King, 231 Franklin St., San Francisco. Est. **$75,000.** CD 2/[illegible]—ENR 3/4.

CONTRACTS AWARDED

Connecticut—FACTORY—Remington Arms Co., Inc., Barnum Ave., Bridgeport, general contract 1 story, 110x110 ft., factory bldg., 549, also 3 smaller bldgs., to Harry Marcus, Jr., Inc., 536 Lindley St., Bridgeport, **$65,000**; electrical work, to Eastern Electric Construction Co., 40 Summerfield Ave., Bridgeport. CD 11/10—ENR 11/12.

Conn., Fairfield—TRUCK TERMINAL—Superboard Freight Lines, Inc., 587 Hollister Ave., Bridgeport, truck terminal, freight depot, State St. exten. and Fiske St., to Joseph Neverdousky, 1200 Mill Plain Rd. Est. **$55,000.** CD 3/2—ENR 3/4.

Ia., Webster City — FACTORY — McCullough's, Inc., rebuilding factory, to Zittergill Mills Co. Over $40,000 incl. equip. CD 2/24—ENR 3/4.

Michigan—PLANT—Aluminum Company of America, 3311 Dunn Rd., Detroit, foundry addn., conveyors, elevators and [illegible] deck for aluminum plant, to Barton-Malow Co., 2631 Woodward Ave. Est. exceeds **$50,000.** Malcolmson, Calder & Hammond, 1217 Griswold St., archts. CD 1/28—ENR 2/4.

Mich., Detroit—MILL—Truscon Steel Co., 615 Wayne St., foundation for brick, steel mill bldg. to O. W. Burke Co., 1010 Fisher Bldg., electrical work, to Gray Electric Co., 627 Jones St. Est. exceeds **$50,000.**

Mich., Muskegan — FACTORY — Muskegan Piston Ring Co., 6 and Alpha Sts., 2 story, 103x131 ft., brick, concrete factory addn., to Fred Movey, 1045 W. Dale Ave. Est. **$40,000.**

★ **Minn., St. Paul**—STEAM POWER PLANT—Northern States Power Co., 3 and Wabasha Sts., general contract brick, pressed con. steam power plant addn., near High Bridge, to F. J. Romer Const. Co., 180 Ramsay St. Total est. **$4,000,000.** Bids 2/[illegible] CD 2/18—ENR 2/25.

Mo., St. Louis—FACTORY—Century Electric Co., 1806 Pine St., general contract 1 story, bsmnt., 108x109 ft., brick, terra cotta, glass block, structural glass hollow tile factory, Chestnut St. between 18 and 19 Sts., to Woermann Const. Co., 3800 West Pine Blvd., **$99,275;** electrical work, to E. A. Koeneman Electric Co., 1408 Delmar Blvd., $9,74[illegible] (**Correction**—general contractor). CD 12/15—ENR 12/17, under CA.

N. J., Deal—LABORATORY—Bell Telephone Laboratory, 463 West St., New York, N. Y., 1 story, 44x120 ft., cinder block laboratory addn., to James Sutherland, Inc., 230 Main St., Asbury Park.

N. J., Hillside (br. Elizabeth)—PLANT—A & B Tire Co., 34 Spring St., Newark, 1 story, concrete block tire processing bldg. addn., to Joseph Krunholz Const. Co., 15 Reynolds Pl., Newark. Charles Ackerman, 105 Halsey St., Newark, archt.

N. J., Jersey City—TOOL and LOCKER, etc.—W. Kellogg Co., foot of Danforth Ave., 1 story, brick, steel, tool and locker bldg., laboratory and storeroom bldg., day labor. **$40,000.**

N. J., Whippany—RADIO LABORATORY, etc.—Bell Telephone Co., 463 West St., New York, N. Y., 1 story, brick radio laboratory and cafeteria bldg., to Charles A. Terry, 20 Franklin St., Summit, **$60,000,** electrical work, to C. P. Dean, Inc., 332 Springfield Ave., Summit.

Ore., The Dalles—STORAGE, etc.—River Terminals, Inc., The Dalles, storage facilities, offices, to Mid-State Constr. Co., The Dalles. Est. **$100,000.**

Rhode Island—FACTORY—Royal Corp., 75 Savin St., Pawtucket, altering 3 story brick factory, Darlington Sect., to Henry M. Soule Co., 110 Armistice Blvd., Pawtucket. Barker & Turoff, 1022 Grosvenor Bldg., Providence, archts. Hamilton Standard Propellers Div., United Aircraft Corp., 400 Main St., East Hartford, Conn., lessee.

Ont., Exeter — PLANT — Canadian Canners Ltd., Exeter, 2 story, 60x170 ft. brick mill construction plant, day labor. About **$45,000.** L. G. Bridgeman, Royal Bank Chambers, London, archt.

Ont., Malton—STORAGE—Victoria Aircraft, Ltd., Malton, addnl. units 4 large storage bldgs. and exten. plant bldgs., to Milne & Nicholls, Ltd., 57 Bloor St. W., Toronto, about **$325,000.** CD 3/1—ENR 3/4.

Sask., Saskatoon — WAREHOUSE — Canada Egg Products, Ltd., 831 2 Ave. N., storage warehouse, to W. C. Wells, Wilkie, **$51,000.** Webster & Gilbert, C. P. R. Bldg., archt.

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